AN INVESTIGATION ON LIGHT COLOR AND STOCKING DENSITY ON SOME PRODUCTIVE PERFORMANCE OF BROILERS

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ABSTRACT

This study was designated to investigate the effect of light color and stocking density on some productive performance of broilers. A total of 675 Ross 308 one-day-old broiler chicks were used in this study. The birds were exposed to white light (WL) as a control , red light (RL), blue light (BL), green light (GL), and Blue – Green mix light (BGL) by a light-emitting diode system (LED) applied for 24 hours daily in separated rooms. The birds were randomly divided and housed into 9 wooden sealed pens of $1m^2$ in three replicates for each density 12, 15 and 18 birds/m^2 in the room. The results showed that the broilers reared under BGL significantly increased ($P< 0.05$) body weight (BW) and weight gain (WG) at 1^{st} , 3^{rd} and 5^{th} week. Obviously, stocking density had no significant effect on BW and WG at 1^{st} week but significantly increased under 12 birds/m^2 at 3^{rd} and 5^{th} week. Feed intake (FI) recorded a significant increase ($P< 0.05$) in broilers reared under WL at 1^{st} week, but no statistical difference was found at 3^{rd} week whereas, FI significantly increased ($P< 0.05$) in broilers reared under BL at 5^{th} week. The stocking density affected FI values which were significantly differed ($P< 0.05$) at 1^{st}, 3^{rd} and 5^{th} week under 12 birds/m^2 compared with other densities. The results of the study revealed a significant increase ($P< 0.05$) of Feed conversion ratio (FCR) in broilers reared under BL at 1^{st} week and RL at 3^{rd} week but there was no significant difference between groups at 5^{th} week. The results indicated a significant difference of FCR value in 18 birds/m^2 at 1^{st} week but there were no significant differences at 3^{rd} and 5^{th} week at different densities. In conclusion, the results of this study indicated that chickens reared under five different color lighting schedules with three bird densities showed that broilers reared under mixing blue – green light under 12 birds/m^2 has a significant positive effects on production performance compared with other light programs and bird densities.

INTRODUCTION

Lighting is a powerful exogenous factor in control of many physiological and behavioral processes. The use of light as a healing agent dates back into antiquity to ancient Rome, Greece, China and Egypt, where colour was used in worship and as a healing agent (1). Light may be the most critical of all environmental factors to birds (2) and consist of three different aspects: quantitative aspect (photoperiod) as well as qualitative aspects include lighting color (wavelength) and light intensity (3). Photoperiod refers to the distribution of light and consists of a scotophase (duration of darkness) and a photophase (duration of light) over a 24 h period (4). There are two light regimes continuous and intermittent light, some studies reported that birds raised under continuous light were significantly heavier than those under intermittent light (5). Day light has relatively wavelengths between 400 and 700 nm. Birds sense light

through their eyes (retinal photoreceptors) and through photosensitive cells in the brain (extra-retinal photoreceptors) (6). The brightness of light is referred to as light intensity. Brightness is defined as the quantity of luminance falling on a unit area of a surface and is measured in units of lux, equivalent to lumens per square meter (4).

Color is an important aspect of light that has been considered at one time as a management tool in poultry production (7). The associated colors are Blue B (435-500 nm), Green G (500-565 nm) and Yellow Y (500-600nm), Orange O (600-630 nm) and Red R(630-700 nm). Wavelengths have different effects on broiler performance (8). LEDs are highly monochromatic, only emitting a single pure color in a narrow frequency range (9). LEDs are becoming increasingly more popular for use in poultry barns (10). The green light promoted broiler growth better at early stage, and the blue light promoted broiler growth better at a later stage under an illumination intensity of 15 lx (11). A similar finding was reported by (12) and (13), who conducted a study on broilers which were grown under different colors of light, blue, green, red, and white. It was found that blue and green both stimulate growth but that the onset of the enhancement occurred at different times.

Stocking density is a much discussed topic in animal science. Increasing stocking density generally leads to a decrease in welfare in many farm animal species (14). Stocking density is calculated by different ways, sometimes stocking density is reported using the number of birds per unit area or the amount of area per bird. Currently many companies calculate stocking density by the pound. Instead of being expressed as the number of birds per unit area, density is calculated as bird weight per unit area (15). In broilers, high densities have been associated with a decline in body weight (BW), feed intake (FI) and feed conversion rate (FCR) (16). It was found that at densities above 19 birds/m^2 chickens grew more slowly and had a lower FCR than at lower densities (15 birds/m^2). There was less uniformity in the BW of these birds (17).

The aim of this study was to investigate the effects of light color programs and stocking density and their interaction on performance of broilers as measured by body weight, average daily gain , feed intake, feed conversion rate and mortality rate.

MATERIALS AND METHODS

Animals and Animal Husbandry

A total of 675 Ross 308 one-day-old broiler chicks were used in this study. The chicks were raised under control condition from day one until 35 days of age in the poultry farm at the College of Veterinary Medicine, Basrah University. Broiler chicks were reared into five light groups in separated rooms 3 x 3 x 4 meters with an average of 135 chicks in each room under LED color lights : White light as a control, Red light (660 nm), Blue light (480 nm), Green light (560 nm) and Blue – Green mix light.

Stocking density of (12, 15 and 18 birds/m^2) were housed into 9 wooden sealed pens of 1m^2 in three replicates in the room. light sources were equalized on the intensity of 5 watt/ m^2 (20 lux) at bird head level and light period of 24 hours daily. Room temperature was initially 34°C and was subsequently reduced by 2°C/week to 26°C at 35 day. Three dietary pellet rations were used consisted of starter, grower, and finisher diets. Total dietary metabolic energy for the starter ,grower and finisher were 2925 , 3111 and 3171 kcal/kg respectively while the values of crude protein were 22.21, 20.14 and 18.08 % respectively. Half cylinder plastic feeders were placed in each pen. The birds were supplied with feed and water *ad libitum,* and diets were formulated to meet the nutrient recommendations for poultry according to

Nutrient Research Center (NRC) 1994, and the feeders were checked twice daily and feed was weighed and manually added when needed.

Measurement of Productive Performance

The body weight of birds was recorded individually at start of experiment and at the end of every week. For this purpose, all the birds from each replicate were weighed with the help of an electrical weighting balance. From the individual weights, the mean weight of all the groups was calculated separately. Feed consumption was calculated at the end of each week. The residual feed was collected once daily before the morning feeding. Recording of weekly feed consumption and weight gain were used to calculate feed conversion ratio as the weight gain per feed intake (4).

RESULTS AND DISCUSSION

Body weight :

Live body weight is one of the most important performance parameter, so determination of effects of light sources on body weight is of particular importance (18). The results as in Table 1 showed that the broilers reared under BGL significantly increased ($P< 0.05$) BW at 1st , 3rd and 5th week which were 164.99, 704.69 and 1710.11 gm respectively.

Table 1: Effect of light color and stocking density on live body weight (gm) of broilers at 35 day (M ± SE)

Age	Light color / Stocking density	WL	RL	BL	GL	BGL	Effect of stocking density
1st week	12 birds/m^2	167.36 ±2.50	159.99 ±1.27	156.25 ±9.54	161.17 ±10.42	169.58 ±8.32	162.87 ±6.41
	15 birds/m^2	165.22 ±5.26	156.77 ±10.79	156.22 ± 4.51	167.37 ±3.32	165.88 ±2.07	162.29 ±5.19
	18 birds/m^2	161.11 ±4.17	140.65 ±3.17	159.69 ± 8.42	152.99 ±1.79	159.53 ±9.14	154.79 ±5.33
	Effect of light color *	164.56^a ±2.97	152.47^b ±5.07	157.38^{ab} ±7.49	160.51^{ab} ±5.17	164.99^a ±6.51	N. S.
3rd week	12 birds/m^2	698.86 ± 37.93	712.86 ± 25.90	655.02 ± 15.55	733.96 ± 25.87	741.50 ± 7.11	708.44^a ± 22.47
	15 birds/m^2	647.91 ± 5.43	672.13 ± 4.76	659.10 ± 20.55	687.81 ± 23.82	701.68 ± 17.66	673.72^b ± 14.44
	18 birds/m^2	572.20 ± 20.02	630.87 ± 7.41	647.45 ± 27.57	632.31 ± 3.04	670.88 ± 26.57	630.74^c ± 16.92
	Effect of light color *	639.65^{bc} ± 21.12	671.95^{bc} ±12.69	653.86^c ± 21.22	684.69^{ac} ± 17.57	704.69^a ± 17.11	*
5th week	12 birds/m^2	1560.70 ± 57.28	1733.13 ±88.36	1551.85 ±65.52	1822.22 ±129.86	1724.86 ± 92.11	1678.55^a ± 86.62
	15 birds/m^2	1453.33 ± 44.17	1440.61 ± 35.92	1671.38 ±14.64	1540.77 ± 56.90	1704.76 ± 32.93	1562.17^b ± 36.91
	18 birds/m^2	1260.57 ± 25.62	1406.66 ±53.64	1460.23 ±62.20	1497.81 ± 63.71	1700.71 ± 47.29	1465.19^c ± 50.49
	Effect of light color	1424.87^c ± 42.35*	1526.80^{bc} ±59.30	1561.15^b ± 46.45	1620.27^{ab} ±83.49	1710.11^a ± 57.44	*

*a, b,c Means in horizontal and vertical rows with different superscripts were significantly different at ($p<0.05$).

* N.S. not significant. SE: standard error

The results of the present study were in agreement with those of (7) , (11), (19) and (20) who reported that short wavelengths (green and blue) generally increase body growth. It has been determined that broilers raised under blue or green lighting tend to exhibit higher growth when compared to birds housed under red or white lighting. It is possible that the effects on growth could be explained by stimulation of bird activity by the long wavelength light penetrating the skull, rather than being related to the direct effect of light on hypothalamic gonadotrophin production (3). Green light enhances growth at an early age, probably by enhancing proliferation of skeletal muscle satellite cells (12). Blue light enhanced growth at a later age, probably by elevation in plasma androgens. Androgens enhance protein synthesis and reduce protein breakdown. As a result, androgens cause muscle accretion and are involved in the normal maintenance of muscular tissue (21).

Obviously, stocking density had no effect on BW at 1st week but significantly differed ($P< 0.05$) at 3 rd and 5th week 708.44 and 1678.55 gm respectively in 12 birds/m^2. The results of this work were consistent with the findings of (17) ; (22) ; (23) ; (24) ; (25) and (26) who reported that the decrease in growth performance resulted from increasing stocking density and could be attributed to the increase in stress resulted from competition for feeds and water (22). High stocking densities were expected to lead to higher glucocorticoid levels, especially because these were combined with increasing group size, as an expression of increased stress. This was expected to be stronger in the later weeks when conditions in the broiler house became more crowded (27). Interaction effects between light color and stocking density were not observed.

Weight gain :

Broilers are known for their ability to gain extreme amounts of weight in short periods of time (10). As in Table 2, The results revealed that weight gain (WG) at 1st , 3 rd week were significantly increased ($P< 0.05$) under BGL 123.48 and 401.07 gm respectively, while broilers reared under GL showed significant increase in WG 447.11 gm at 5th week. These effects were similar and in agreement with most previous research, (11) and (13) who observed that the effect of light wavelength on broiler growth is age dependent with green light stimulating early weight gain (3 days) in contrast to blue light having late growth enhancement. When broilers have been exposed to violet, blue or green (415 to 560 nm) monochromatic light at the same irradiance, body weight gain up to 11 weeks has been greater than for birds given red or white light (28).

Table 2: Effect of light color and stocking density on weight gain (gm) of broilers at 35 day (Mean± SE)

Age	Light color / Stocking density	WL	RL	BL	GL	BGL	Effect of stocking density
1st week	12 birds/m^2	125.69 ± 2.50	118.33 ± 1.27	114.58 ± 9.54	119.49 ± 10.41	127.91 ± 8.32	121.20 ± 6.40
	15 birds/m^2	122.99 ± 4.85	115.11 ± 10.00	115.11 ± 4.15	126.79 ± 3.99	124.21 ± 2.07	120.84 ± 5.01
	18 birds/m^2	119.44 ± 4.16	99.34 ± 3.21	118.03 ± 8.43	111.79 ± 2.22	118.33 ± 9.18	113.38 ± 5.44
	Effect of light color *	122.71^a ± 3.83	110.92^b ± 4.82	115.90^{ab} ± 7.37	119.36^{ab} ± 5.54	123.48^a ± 6.52	N. S.
3rd week	12 birds/m^2	345.70 ± 19.53	396.49 ± 18.30	355.99 ± 3.42	404.04 ± 27.18	416.52 ± 6.23	383.75^a ± 14.93
	15 birds/m^2	341.97 ± 24.40	368.08 ± 20.91	355.76 ± 9.86	358.30 ± 20.09	398.57 ± 19.56	364.54^{ab} ± 18.96
	18 birds/m^2	279.52 ± 11.31	369.01 ± 14.18	361.82 ± 24.69	350.00 ± 5.34	388.11 ± 19.42	349.69^b ± 14.98
	Effect of light color *	322.39^c ± 18.41	377.86^{ab} ± 17.79	357.86^b ± 12.65	370.78^b ± 17.53	401.07^a ± 15.07	*
5th week	12 birds/m^2	397.51 ± 54.08	432.90 ± 36.31	409.72 ± 55.50	624.66 ± 170.14	414.88 ± 72.26	455.93^a ± 77.65
	15 birds/m^2	368.27 ± 31.30	279.73 ± 7.77	494.34 ± 32.24	358.54 ± 13.63	478.24 ± 32.65	395.82^{ab} ± 23.51
	18 birds/m^2	335.53 ± 24.25	281.94 ± 30.45	351.29 ± 14.84	415.67 ± 25.27	448.20 ± 79.82	366.52^b ± 34.92
	Effect of light color *	367.10^{ab} ± 36.54	331.52^b ± 24.84	418.45^{ab} ± 34.19	466.29^a ± 69.68	447.11^a ± 61.57	*

*a, b,c Means in horizontal and vertical rows with different superscripts were significantly different at ($p<0.05$).

* N.S. not significant. SE: standard error

In other research, (29) believed that broilers reared under three different colors of light (white, blue or red) showed no effect ($P>0.05$) on the weight gain of broilers. Many studies indicated that broilers raised under blue or green light were heavier than those raised under red or white light. This combination effect calms the birds and helps reduce cannibalism as well as improving bird performance (11). The stocking density was not significant at 1st week but the results differed significantly ($P< 0.05$) at 3rd and 5th week which were 383.75 and 455.93 gm respectively in 12 birds/m^2. Research on the effects of stocking density on broiler chicken welfare has been conducted over a wide range of densities. The present study was similar to (24), (30) and (31) who proved that increased stocking density resulted in decreased body weight gain. Generally it is believed that green or blue light results in better performance, possibly due to a calming effect on broilers (7). The analysis of variance showed that light color and stocking density had no interaction effect on weight gain of broilers in this experiment.

Feed intake :

The effects of the various lighting treatments on FI were shown in Table 3, which indicated that broilers reared under white color was significantly higher ($P< 0.05$) FI at 1st week 171.19 gm Compared with other groups. The significant effect of WL on FI was confirmed by (10) who found that birds during weeks 1 to 3, prefer white light. The chicks demonstrated a preference for pelleted feed and white light ($P <0.01$) and they chose not to feed under green or blue light. A possible explanation as to why broilers prefer to consume feed under white light could be due to it helps them to identify texture differences they cannot see under different colors. Adopting a strategy allowing broiler chicks to feed under white light and rest under blue or green light (10).

Table 3: Effect of light color and stocking density on feed intake (gm) of broilers at 35 day (Mean± SE)

Age	Light color / Stocking density	WL	RL	BL	GL	BGL	Effect of stocking density
1st week	12 birds/m^2	188.19 ± 2.50	149.99 ± 12.73	137.49 ± 9.08	152.52 ± 7.54	167.77 ± 1.54	159.19^{a} ± 6.67
	15 birds/m^2	168.88 ± 9.87	133.88 ± 7.47	143.88 ± 10.28	167.39 ± 12.55	145.59 ± 3.03	151.93^{a} ± 8.64
	18 birds/m^2	156.49 ± 15.31	118.99 ± 10.01	121.44 ± 8.33	139.99 ± 5.27	132.85 ± 13.34	133.95^{b} ± 10.45
	Effect of light color *	171.19 ^{a} ± 9.22	134.29^{c} ± 10.07	134.27^{c} ± 9.23	153.30 ^{b} ± 8.45	148.73^{bc} ± 5.97	*
3rd week	12 birds/m^2	557.19 ± 16.93	561.06 ± 21.91	551.75 ± 24.12	577.73 ± 36.53	580.00 ± 17.32	565.54 ^{a} ± 23.36
	15 birds/m^2	484.63 ± 32.20	479.89 ± 6.71	554.32 ± 49.01	514.09 ± 7.55	531.47 ± 31.46	512.88^{b} ± 25.38
	18 birds/m^2	509.86 ± 35.99	497.22 ± 31.02	467.93 ± 6.62	515.37 ± 28.40	546.09 ± 8.48	507.29^{c} ± 22.10
	Effect of light color N. S.	517.23 ± 28.37	512.72 ± 19.88	524.67 ± 26.58	535.73 ± 24.16	552.52 ± 19.08	*
5th week	12 birds/m^2	875.75 ± 79.65	975.97 ±119.21	879.62 ± 72.31	1097.22 ± 45.00	1011.90 ± 154.76	968.09^{a} ± 114.18
	15 birds/m^2	765.87 ± 35.27	675.58 ± 27.41	1152.77 ± 97.22	808.28 ± 12.76	764.28 ± 74.57	833.35^{b} ± 49.44
	18 birds/m^2	716.34 ± 26.47	704.65 ± 43.30	818.90 ± 56.69	839.39 ± 30.75	825.50 ± 170.83	780.95^{b} ± 65.60
	Effect of light color *	785.99^{b} ± 47.13	785.40^{b} ± 63.30	950.43^{a} ± 75.40	914.96 ^{ab} ± 62.83	867.23^{ab} ± 133.38	*

*a, b,c Means in horizontal and vertical rows with different superscripts were significantly different at ($p<0.05$).

* N.S. not significant. SE: standard error

There were no significant differences ($P>0.05$) in FI at 3rd week were found between the experimental groups but significantly increased ($P< 0.05$) under BL 950.43 gm compared with other groups at 5th week. This study helps to support the theory that blue light creates a calming effect on birds, being less active in blue light than in red or white light and choose to spend more time in blue light along with a

filled crop and gizzard content (7). On the other hand many researchers indicated that broilers reared under different colors of light showed no effect (P>0.05) on feed intake (28) and (29). A significant differences were observed on FI within all different densities at 1st , 3rd and 5th week which were 159.19, 565.54 and 968.09 gm under 12 birds/m^2. The present results were in agreement with those of (25) who refered to reduce of FI under high density of birds. Perhaps, this may be due to increasing competition for feed as a result of increasing stocking density, so it is important to ensure that adequate floor space is available for each bird (32). The Analysis of the results showed that there was no interaction between light color and stocking density on FI of broilers within all experimental groups.

Feed conversion ratio :

Table 4 displayed that results of the present study revealed a significant difference (P< 0.05) of FCR in broilers reared under BL at 1st week which was 1.16 (gm FI/gm WG).

Table 4: Effect of light color and stocking density on feed conversion ratio (gm FI/gm WG) of broilers at 35 day (Mean± SE)

Age	Light color / Stocking density	WL	RL	BL	GL	BGL	Effect of stocking density
1st week	12 birds/m^2	1.49±0.04	1.26±0.10	1.20±0.07	1.29±0.13	1.31±0.07	$1.31±0.08^{b}$
	15 birds/m^2	1.36 ± 0.04	1.16 ± 0.04	1.25 ± 0.12	1.32 ± 0.13	1.16 ± 0.00	$1.25\ 0.06^{ab}$
	18 birds/m^2	1.29 ± 0.08	1.19 ± 0.09	1.02 ± 0.01	1.24 ± 0.07	1.11 ± 0.02	$1.17 ± 0.05^{a}$
	Effect of light color *	$1.38±0.05^{b}$	$1.20± 0.07^{a}$	$1.16 ± 0.06^{a}$	$1.28±0.11^{ab}$	$1.20 ±0.03^{a}$	*
3rd week	12 birds/m^2	1.61 ± 0.06	1.40 ± 0.06	1.54 ± 0.05	1.43 ± 0.08	1.39 ± 0.04	1.47 ± 0.05
	15 birds/m^2	1.41 ± 0.02	1.30 ± 0.09	1.55 ± 0.10	1.43 ± 0.07	1.32 ± 0.02	1.40 ± 0.06
	18 birds/m^2	1.68 ± 0.06	1.34 ± 0.05	1.34 ± 0.10	1.46 ± 0.07	1.37 ± 0.02	1.44 ± 0.06
	Effect of light color *	$1.57 ± 0.04^{c}$	$1.35± 0.06^{a}$	$1.48±0.08^{bc}$	$1.44±0.07^{ab}$	$1.36± 0.02^{a}$	N. S.
5th week	12 birds/m^2	2.10 ± 0.22	2.02 ± 0.14	2.18 ± 0.16	1.89 ± 0.25	$2.45± 0.05^{C}$	2. 13 ± 0.16
	15 birds/m^2	1.99 ± 0.22	2.14 ± 0.26	2.25 ± 0.28	2.25 ± 0.05	$1.60±0.18^{A}$	2.05 ± 0.19
	18 birds/m^2	2.15 ± 0.17	2.53 ± 0.19	2.32 ± 0.06	1.90 ± 0.14	$1.82± 0.11^{B}$	2.14 ± 0.13
	Effect of light color N. S.	2.08 ± 0.20	2.23 ± 0.19	2.25 ± 0.16	2.01 ± 0.14	1.96 ± 0.11	N. S.

*a, b,c Means in horizontal and vertical rows with different superscripts were significantly different at (p<0.05).

* N.S. not significant.

A,B,C Means in vertical rows with different superscripts were significantly different of interaction between light color and stocking density at ($p<0.05$). SE: standard error.

The results of this work were consistent with the findings of (29) and (33) who reported a significant difference in FCR of broilers reared under BL whereas, in broilers reared under blue or green light were not affected (34). The present study showed significant difference ($P< 0.05$) 1.35 (gm FI/gm WG) in broilers reared under RL at 3rd week, but there was no significant difference between groups at 5th week. Improvement of feed conversion under RL was in agreement with that of (35) when compared with other color lights, while (36) indicated that the highest value of FCR was in blue treatment. The effect of stocking density on feed conversion data were presented in Table 4, the best significant value ($P< 0.05$) of FCR at 1st week was recorded 1.17 (gm FI/gm WG) in broilers under 18 birds/m^2. No significant differences on FCR were found between the experimental groups at 3rd and 5th week under different densities. This result was in agreement with (22) as well as (25) and (37), who summarized that stocking density had no significant effect on FCR during 7-43 days, whereas (38) conducted a study examining different densities and found that feed conversion was significantly improved when birds given more space. The analysis of variance showed that there was significant interaction ($P< 0.05$) between light color and stocking density at 5th week , the best value was 1.60 (gm FI/gm WG) in broilers reared under 15 birds/m^2.

تأثير لون الضوء وكثافة الطيور على بعض الصفات الإنتاجية في فروج اللحم

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** المستشفى البيطري في البصرة ، البصرة ، العراق

الخلاصة

صمم هذا البحث لدراسة تأثير لون الضوء وكثافة الطيور على بعض الصفات الإنتاجية لفروج اللحم. استخدم لغرض انجاز البحث ستمائة وخمس وسبعون من أفراخ فروج اللحم نوع Ross 308 بعمر يوم واحد وتمت تربيتها لمدة 35 يوما. قسمت الأفراخ إلى خمس معاملات تبعا لبرنامج الإضاءة الملونة 24 ساعة ففي المعاملة الأولى خضعت الطيور الى الضوء الأبيض كمعاملة سيطرة والضوء الأحمر في المعاملة الثانية والأزرق في المعاملة الثالثة والأخضر في المعاملة الرابعة ووضع مزيج من الضوء الأزرق والأخضر في المعاملة الخامسة . اشتملت المعاملة الواحدة على 135 طير ربيت في غرف مستقلة تحتوي على تسعة أكنان مساحة الكن الواحد متر مربع حيث قسمت الطيور تبعا لكثافة التربية إلى ثلاث مكررات في الكثافات 12 ، 15 و 18 طير/ $م^2$. أشارت نتائج البحث إلى وجود تأثير معنوي ($P< 0.05$) للون الضوء في وزن الجسم الحي ومعدل الزيادة الوزنية (غم) لفروج اللحم حيث تفوقت معاملة الطيور المرباة تحت تأثير المزج بين الضوء الأزرق والأخضر معنويا ($P< 0.05$) على بقية المعاملات طيلة أسابيع التجربة، ولم يظهر تأثير معنوي لكثافة التربية على وزن الجسم الحي والزيادة الوزنية للطيور في الأسبوع الأول بينما تفوقت الطيور المرباة بمستوى كثافة 12 طير/ $م^2$ معنويا ($P< 0.05$) في الأسبوعين الثالث والخامس. معدل استهلاك العلف اظهر تفوقا معنويا ($P< 0.05$) في الطيور المرباة تحت تأثير الضوء الأبيض في الأسبوع الأول ولم يسجل وجود تأثير معنوي في الأسبوع الثالث بينما سجل تفوق معنوي ($P< 0.05$) في استهلاك العلف في الطيور المرباة تحت تأثير الضوء الأزرق في الأسبوع الخامس، أما بالنسبة إلى تأثير كثافة الطيور في معدل استهلاك العلف ، أشارت النتائج إلى وجود تفوق معنوي في معاملة الطيور المرباة بمستوى كثافة 12 طير/ $م^2$ عن بقية الكثافات طيلة أسابيع التجربة. نتائج الدراسة الحالية أوضحت وجود تفوق معنوي($P< 0.05$) في كفاءة التحويل الغذائي في الفروج المرباة تحت

تأثير الضوء الأزرق في الأسبوع الأول وتفوق معاملة الفروج المرباة تحت تأثير الضوء الأحمر في الأسبوع الثالث ولم يسجل تأثير معنوي للون الضوء في كفاءة التحويل الغذائي في الأسبوع الخامس، بينما سجلت وجود تفوق معنوي ($P< 0.05$) لكثافة الطيور المرباة بمستوى 18 طير/ م^2 في الأسبوع الأول ولم يسجل وجود تأثير معنوي لكثافة الطيور في كفاءة التحويل الغذائي للطيور المرباة في بقية أسابيع التجربة. من خلال هذه الدراسة نستنتج ان فروج اللحم المرباة تحت تأثير المزج بين الضوء الازرق والاخضر وفي مستوى كثافة 12 طير/ م^2 تفوقت معنويا ($P< 0.05$) في الاداء الانتاجي على بقية المعاملات.

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