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Influence of Lighting on Production and Agonistic Behavior of Broiler

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Abstract: 300 day-old broiler purchased, initially weighed and divided into A, B and C groups, 100 chicks each and provided with white, blue and red lights, respectively. Floor brooding system was arranged. Initially broiler started and later finisher feeds (both iso-caloric and iso-nitrogenous) and water were made available over 24 hours. Agonistic behavior was recorded with 2 minutes interval over 24 hours during 2nd, 4th and 6th weeks by using time Sampling Technique. Total average feed intakes (3.394, 3.366 and 3.362) and live body weights (1.495, 1.510 and 1.491) kg per broiler were not different significantly for A, B and C groups, respectively and similarly followed by their interactions between groups and weeks ($P>0.05$). However, week response was significant for all ($P<0.01$). Broiler carcass recovery was 58.0, 60.0 and 59.0 percent for A, B and C groups. Mortality was higher for blue (B) than then red © and white (A) light group (6, 4 and 2%), respectively. Both, average aggression instigator and target incidences were higher for A (3.31 vs 1.22) than C (1.92 vs 1.08) and B (0.78 vs 0.47) Incidence/hr/groups, respectively. It is concluded that blue light provided calm and quietness due to least agonistic behavior within broiler groups mates than red and white groups.

Key words: Broiler, white, blue and red colours, feed intake, body and carcass weights and agonistic behavior

Introduction

Light is an important aspect of an animal's environment. Avian as well as mammalian species respond to light energy in a variety of ways, including growth and reproductive performance. The value of regulating the photoperiod of poultry to stimulate reproduction has been recognized for many years and is used regularly by commercial poultry farmers. Three major functions of light: in chicken observed first to facilitate sight, second to stimulate internal cycles due to day-length changes and third to initiate hormone release. Providing light for chickens has become a little more complex during the last 14 years than just screwing in a bulb and flicking on a switch. Now there are a wide variety of lighting programs and devices available to poultry producers, each with its own characteristics and applicability. However, poultry farmers may requires the guidelines about type, intensity, colour and height of lights provided to chicken time to time.

Light colour may effects on behvaiour, growth and reproduction in poultry. Birds sense light through their eyes (retinal photoreceptors) and through photosensitive cells in the brain (extra-retinal photoreceptor). Since long wavelengths of light (towards red end of the spectrum) penetrate the skin and skull more efficiently than short wavelengths, it has been observed that growth and behavior are linked to retinal photoreception (and shorter wavelengths) whereas the reproduction has been linked to extra-retinal photoreceptor. Blue light has a calming effect while red has been used to reduce cannibalism and either picking. Both blue and green lights stimulates growth while orange and red stimulates reproduction. Birds have pigmented oil droplets on their cone cells that correspond to peak sensitivities of 415nm, vilet; 160nm, blue; 510nm, green and 560nm, yellow or young birds with a peak at 580 nm, orange for adults. Recently, it has been shown that the lens of birds was transparent to light in the UVA range (320-400nm). However, they probably see brightness of color different from humans. These facts were important to remember when selecting a light source for illuminating poultry (Darre and Rock, 1995) Modern poultry farming has proved that broiler production as well as behavior influenced by intensity and colour of lighting provided. Duration depends upon the age and type of housing. Chickens can be exposed to 21-23 hrs of continuous light at one and two days of age and then reduced to 15 or 16 hrs upto three weeks. Later it reduced to 10-12 hours or as dictated by natural day length.

Materials and Methods

300 days-old Hubbard broilers were purchased from Hyderabad, initially weighed and housed at Poultry Experiment Station, Department of Poultry Husbandry, Faculty of Animal Husbandry and Veterinary Sciences, Tandojam. Broiler were randomly divided into three groups, one hundred each viz. Group \A, B and C. Three different light colours such as white, Blue and Red were introduced to above groups A, B and C, respectively. All electric 40/60 watt bulbs were used at the height of 6 feet in each group. Similar coloured cloth walls were made around the groups B and C, such as blue and red cloth walls. Brooding of group A, B and C was arranged in three separate partitions. Clean and dry wooden-dust was purchased and used as litter and spread about 2 to 3 inches thick after using dry

limestone on floor. Chick-paper (Horka-200) was used to cover the litter and also provide comfort to chicks during first week of the brooding. At first day sugar mixed water was offered to chicks for fleshing. Both feed and water were provided twice daily *ad libitum*, the feed refusal from each group was collected and weighed at morning. Vaccination was performed as per schedule suggested by Pakistan Poultry Association, Hyderabad.
The broilers were individually weighed each week by using weighing scale/balance. The aggression instigator and target behaviours of broilers were recorded in each group on the prescribed proforma (hourly behavior recording sheet for broiler) with 2 minutes interval per recording over 24 hours during 2nd 4th and 6th weeks of recording by using Time Sampling Technique (Rind, 1995). Five broiler were randomly selected from each group at the completion of trial and slaughtered for the recording of carcass weight and percentage. The data was tabulated and analysed by using Minitab Microsoft Computer Software in General Linear Model (M. T. B. 1992)

Result and Discussion

Production

Feed Intake: Total feed intake revealed that group A took comparatively ($P>0.05$) more feed (3.394) than B (3.366) and C (3.362) kg/b, respectively. The interaction between groups and weeks illustrate that the broiler of all groups increased consumption of feed continually with advancement of their age i.e. 6 weeks ($P>0.05$). Similarly Wathes, *et al.* (1982) reported that different coloured light shad no significant effect on feed intake of male or remale broiler.

Live Body Weight: Both average live body weight and averge weight gain of broiler at six weeks were not different significantly ($P>0.05$) between the various groups. The interaction between the groups and weeks was non-significant. Similar findings have been reported by Watches, *et al.* (1982) and Celen and Testik (1994) reported that the growth of the male and female broiler remained unaffected due to different coloured lights, while Halevy, *et al.* (1998) reported higher muscle weight (carcass) in green and blue light groups as compared to red and white light groups. Carcass percentage was observed in groups B (60%) was comparatively better than C (59%) and A (58%).

Table 1: Average feed intake of broiler kept in various light colours (g/b/d)

Weeks	Groups		
	A	B	C
W1	11.29	11.14	11.14
W2	36.71	35.86	36.39
W3	70.71	72.61	72.01
W4	103.64	102.07	102.31
W5	126.19	123.25	122.87
W6	136.58	135.95	135.71
Total feed intake (kg/b)	3.394	3.366	3.362

Note: Probability for groups = 0.920, weeks = 0.001 and groups * weeks = 0.99

Table 2: Average live body weight of broiler kept in various light colours (kg/b)

Weeks	Groups		
	A	B	C
W0	0.050	0.049	0.049
W1	0.095	0.097	0.098
W2	0.236	0.232	0.210
W3	0.496	0.535	0.530
W4	0.886	0.891	0.894
W5	1.277	1.274	1.348
W6	1.545	1.559	1.540
Av. Weight gain	1.495	1.510	1.491
Carcass (%)	58.0	60.0	59.0

Note: Probability for groups = 0.696, weeks = 0.001 and groups * weeks = 0.879

Table 3: Total mortality of broiler kept in various light colours (%)

Weeks	Groups		
	A	B	C
W1	0	0	2
W2	1	0	1
W3	0	1	0
W4	0	1	0
W5	1	2	0
W6	0	2	1
Total	2	6	4

Note: Probability for groups = 0.001, groups * weeks = 0.001 and groups * weeks = 0.99

Table 4: Average agression instigator behavior of broiler kept in various light colours (incidence/hr/group)

Weeks	Groups		
	A	B	C
W2	8.00	1.58	4.08
W4	1.58	0.75	1.33
W6	0.33	0.00	0.33
Overall	3.31	0.78	1.92

Table 5: Average aggression target behavior of broiler kept in various light colours (incidence/hr/group)

Weeks	Groups		
	A	B	C
W2	2.50	0.67	1.75
W4	0.83	0.75	1.17
W6	0.33	0.00	0.33
Overall	1.22	0.47	1.08

Note: Probabilityfor groups = 0.034, weeks = 0.001 and groups * weeks = 0.164

Mortality: Total mortality was significantly affected under different lighting colours, which was ranged between 2 to 6 percent, However, significantly more number of broilers were died in group B (6) than group C (4) and group A (2), respectively (Table 3). The interaction between groups and weeks was also significantly different ($P<0.001$). Phogat, *et al.* (1985) reported different mortality rates in broiler kept under different coloured light, while Celen and Testik (1994) reported lower mortality of broiler kept in blue light.

Behavior

Aggression Instigator: Average aggression initiated by broiler of group A, B and C groups recorded in the second week were 8.00, 1.58 and 4.08; in fourth week; 1.58, 0.75 and 1.33 and in sixth week 0.33 and 0.00 and 0.33 incidence/hr/group, respectively (Table 4. Overall average aggression instigator behavior showed that group A was initiated significantly more aggression ($P=0.01$) than C ad B groups (3.31, 1.92 and 0.78 incidence/hr/groups), respectively. The differences between the groups and weeks was highly significant ($P<0.05$), that it was declined during fourth and sixth weeks in all groups, Similarly, the overall differences between 2nd, 4th and 6th weeks (4.52, 1.22 and 0.22 incidence/hr/group), respectively was also significant. Prayitno, *et al.* (1977) reported less birds aggression kept under green and blue light s as compared to red and white lights, because green and blue colour lights broiler were in more quietness.

Aggression Target: Average aggression targeted behavior of broiler were 2.50, 0.67 and 1.75, 0.83, 0.75 and 1.17 and 0.33, 0.00 and 0.33 incidences/hr/group during 2nd, 4th and 6th week for A, B and C groups, respectively and overall difference between each groups (1.22, 0.47 and 1.08 incidence/hr/group) was significantly different ($P<0.05$, Table 5). While the interaction between groups and weeks was non-significant. Prayitno, *et al.* (1997) reported less birds aggression kept under green and blue lights as compared to red and white lights.

Conclusion

It is concluded that blue light seems to provide calm, quietness and confortness by minimizing agonistic activities within broiler group mates than red and white lights. Prayitno *et al.*.(1997) had similarity with the present results,

who reported less aggression of birds kept under green and blue lights as compared to red and white lights, because both green and blue colour lights provided better calm.

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