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Tasaduk Khaliq
Center for Research on Poultry, Division of Livestock Production and Management, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

AA Khan
Center for Research on Poultry, Division of Livestock Production and Management, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

Parwaiz Ahmad Dar
Center for Research on Poultry, Division of Livestock Production and Management, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

Tahir Nazir
Division of Livestock Products Technology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

Insha Afzal
Center for Research on Poultry, Division of Livestock Production and Management, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

Mir Bilal
Division of Veterinary Biochemistry, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

P Tarique
Division of Livestock Products Technology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

Correspondence
Tasaduk Khaliq
Center for Research on Poultry, Division of Livestock Production and Management, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir Shuhama, Alusteng, Srinagar, Jammu and Kashmir, India

Behavioral study of broilers reared under different colours of light in the evening hours

Tasaduk Khaliq, AA Khan, Parwaiz Ahmad Dar, Tahir Nazir, Insha Afzal, Mir Bilal and P Tarique

Abstract
The present study was carried out during month of January and February in 2015 to evaluate the effect of different wavelengths of light on the behavioral aspects of broilers in the evening hours. A total of 240-day-old straight run broiler chicks were divided into 4 treatments each comprising of four replicates of 15 birds each. Chicks pertaining to treatment group G_1, G_2, G_3 and G_4 were provided blue light, green light, red light and plain incandescent light respectively. All treatments were provided continuous artificial photoperiod of 24 hrs upto the rearing period (6wks). The behavioral expressions of study performed by birds was analyzed, assessed and evaluated during different age groups at 2nd, 3rd and 5th weeks of age revealed that birds reared under blue and green light were more calm and relaxed while as those reared under red or yellow light exhibited aggressiveness.

Keywords: Broilers, behavioral expressions, evening hours, light, wavelength

Introduction
Eyes are the main sense organs, and vision is one of the main senses that influence broilers. Many studies have been conducted to evaluate the effects of different type of light source on production, behavior and economics of broilers by Vandenberg & Widowski, [18] and light is considered as the cheapest source and acts as a very good managemental tool for their good welfare as well. The welfare of birds and improved behavior will increase their production performances and Olanrewaju *et al*., [13] reported that sunlight has a relatively even distribution of wavelengths between 400 and 700 nm. The main serious welfare problems in broiler production associated with the rapid growth is the high incidence of skeletal disorders, ultimately leads to impaired mobility or lameness (European Commission, [6]). Light can also affect lameness and mortality through multiple ways; directly through light intensity, colour and photoperiodic regime and indirectly via properties of litter quality reported by Bizeray [1]. Effects of wavelength on growth and welfare have been studied by several authors (Prayitno *et al.*, [15], Prescott *et al*., [16], Classen [3], and Olanrewaju *et al*., [13]. However, studies conducted under temperate agroclimatic conditions of Kashmir valley on these aspects, are limited. Therefore the present study was undertaken to assess the behavioral trends of broilers reared under different colours of light in the evening hours.

Materials and Methods
The present study was conducted during winter months of January and February in the temperate climatic conditions of Kashmir valley. In this trial two hundred and forty, day old commercial broilers were distributed into four treatment groups with four replicates of 15 chicks each. Chicks allotted to each treatment were housed in a light proof enclosure subdivided into four separate pens. The light proofing was ensured through application of black curtains along enclosure partitions and windows. The chicks were brooded and grown on deep litter with standard management conditions with *adlib* feeding and watering and different treatments were lit with different colours of light viz, Blue (G_1) Green (G_2), Red (G_3) of uniform intensity. The light intensity was monitored regularly using a digital luxmeter. The control group (G_4) received a plain incandescent light of same intensity as that of other groups. Different color of light was produced by wrapping a cellophane paper of particular colour around a plain incandescent bulb. Incandescent bulb of 60 watt power was invariably used for lighting.

Expression of different behavioral patterns like resting, preening, walking, eating, drinking, dust bathing, fighting, standing, pecking, scratching, sleeping, leg stretching, wing stretching, prostration, lying down and wing flapping were noticed in the chicks at 2, 3 and 5th week of age by installing a video camera (Kodak easy share C913 9.2 Mega pixels) in the rearing pens.)

Different behavioral expression like resting, consummatory, locomotory comfort, exploratory and aggression observed in broilers reared under different colours of light during evening hours at 2, 3 and 5th weeks of age are presented in the Tables 1-3. The record of 30_min. duration from each treatment group at 2, 3 and 5th week of age in evening hours was analyzed to assess the behavior expressions. First 2-3 minutes was not included in the study. Later 60 frames 10 sec apart were observed and behavioral expression per bird were noted. The behavioral events thus counted were expressed as the %age of total (60) events.

Again Video camera was used to differentiate different behavior patterns in chicken. The same behavioral patterns was also recorded by Wood Gush *et al.*, [19]

Behavior trends/ways.	Activity series.
Inactive	Sleeping, Resting and Standing.
Locomotory	Walking, running and jumping.
Consummatory	Feeding, dozing and drinking.
Exploratory	Foraging, pecking at litter and other inanimate objects
Comfort	Dust-bathing, Preening, Stretching, feather-ruffling, leg stretching and Wing-flapping

Statistical analysis

Data generated on behavioral expressions of production was grouped and tabulated treatment wise and analyzed using Analysis of variance (ANOVA) as per Snedecor and Cochran [17]. The difference within the groups was estimated using Duncan's [5] Multiple range test. Statistical software SPSS 15.00 was used for analysis

Results

Effect of different colours of light on behavior

Different behavioral expression like resting, Consummatory, locomotory comfort, exploratory and aggression observed in broilers reared under different colours of light during evening hours at 2, 3 and 5 weeks of age are presented in the Tables 1-3

Behavioral expressions at 2 weeks of age

The behavioral expressions of broilers recorded in the evening hours at 2 weeks of age are depicted in Table 1. Again significantly higher resting behavior of 62.50±2.50% was noticed in broilers reared under blue light (G_1) as compared to the other treatment groups. Significantly higher Consummatory behavior (84.44±4.01%) was recorded in birds reared under green light (G_2) followed by 63.33±1.92% in control group. Comfort behavior was expressed only by birds reared under blue light constituting 19.83±1.59% of all the behavioral patterns recorded in the group. Aggressive behavior was noted in G_3 and G_4 and it constituted 8.67±1.33 and 2.00±0.0% of various behavioral patterns recorded in their respective groups. Almost similar exploratory behavior was noted in G_3 and G_1 groups constituting 6.33±0.01 and 5.56±1.11% of various behavioral patterns recorded in these two groups.

Table 1: Behavioral expressions (%) of broiler chicks reared under different colours of light in evening hours at 2 weeks of age.

Behavioral Expressions (% of total behavioral events counted)	Blue (G_1)	Green (G_2)	Red (G_3)	Yellow (G_4)
Resting	$62.50±2.50^{d}$	$3.33±0.00^{a}$	$37.78±2.22^{c}$	$17.78±1.11^{b}$
Consummatory	0.00^{a}	$84.44±4.01^{d}$	$43.33±5.09^{b}$	$63.33±1.92^{c}$
Locomotory	$10.00±1.36^{a}$	$12.22±4.00^{ab}$	$8.00±1.92^{a}$	$18.89±1.11^{b}$
Comfort	$19.83±1.59^{b}$	0.00^{a}	0.00^{a}	0.00^{a}
Aggression	0.00^{a}	0.00^{a}	$8.67±1.33^{c}$	$2.00±0.0^{b}$
Exploratory	$6.33±0.01^{b}$	0.00^{a}	$5.56±1.11^{b}$	0.00^{a}

Means across columns bearing different superscripts differ significantly ($P<0.05$)

Behavioral expressions at 3 weeks of age

In evening hours at three weeks of age as depicted in Table 2, resting behavior constituted 75.58±1.11% of all the behavioral expressions in red group, followed by 42.11±4.84% in blue, 24.44±2.94% in green and 17.78 ±2.22% in control group. The resting behavior in red group was significantly higher than that of other three groups and in turn the resting behavior in blue group was significantly higher than that of green and control group. About 58.80±1.11 and 58.79±4.84% of the behavioral actions were of Consummatory nature in G_4 and G_2 respectively that were significantly higher than 22.22 ±2.22% Consummatory events recorded in G_1. Activities indicative of comfort constituted 7.78±1.11% of total activity profile in G_1 and G_2 while as no comfort behavior was exhibited by birds of G_3 and G_4. Aggressive behavior to the extent of 6.67±1.92, 8.89 ±2.22 and 4.44±1.11 % respectively was recorded only in G_3, G_1 and G_2 groups and exploratory behavior of the order of 10.00 ±1.92 and 8.89 ±2.22 % was noted only in G_3 and G_2 groups respectively. No aggressive behavior under plain incandescent light and no exploratory behavior was observed under green and plain incandescent light.

Table 2: Behavioral expressions (%) of broiler chicks reared under different colours of light in evening hours at 3 weeks of age.

Behavioral expressions (% of total behavioral events counted)	Blue (G_1)	Green (G_2)	Red (G_3)	Yellow (G_4)
Resting	42.11±4.84^b	24.44±2.94^a	75.58±1.11^c	17.78 ±2.22^a
Consummatory	22.22 ±2.22^b	58.79 ±4.84^c	0.00^a	58.80 ±1.11^c
Locomotory	15.56±2.94^b	4.44 ±1.11^a	7.78±1.11^a	23.33±1.92^c
Comfort	7.78±1.11^b	7.78 ±1.11^b	0.00^a	0.00^a
Aggression	3.44±1.11^b	4.44±1.11^b	6.67±1.92^b	0.00^a
Exploratory	8.89 ±2.22^b	0.00^a	10.00 ±1.92^b	0.00^a

Means across columns bearing different superscripts differ significantly (P<0.05)

Behavioral expressions at 5 weeks of age

In the evening hours at 5 weeks of age resting behavior was found to form significantly higher proportion of the total activity profile of G_2 (61.89±1.11%) followed by G_3 and G_1 (40.83±2.50 and 33.17±1.60 % respectively) and lastly G_4 (17.50±1.60%). Significantly higher locomotory activities were recorded in G2 and G4 (20.33±1.92 and 22.50±1.60 %) as compared to G_1 and G_3 (12.50±1.60 and 13.50±1.42 %). Comfort behavior comprising 25.00±3.20% of the activity profile was noted in G_1 group and aggressive behavior comprising 17.33±1.92% of the activity profile was noted in G_3 group. Exploratory actions formed 17.78±1.11, 4.00±1.11 and 3.66±1.33 % of the behavioral activities recorded in G_2, G_3 and G_1 groups respectively. No exploratory behavior was noticed in G_4 group.

Table 3: Behavioral expressions (%) of broiler chicks reared under different colours of light in evening hours at 5 weeks of age.

Behavioral expressions (% of total behavioral events counted)	Blue (G_1)	Green (G_2)	Red (G_3)	Yellow (G_4)
Resting	33.17±1.60^b	61.89±1.11^c	40.83±2.50^b	17.50±1.60^a
Consummatory	26.67±3.85^b	0.00^a	24.11±4.00^b	60.00±2.50^c
Locomotory	12.50±1.60^a	20.33±1.92^b	13.50±1.42^a	22.50±1.60^b
Comfort	25.00±3.20	0.00	0.00	0.00
Aggression	0.00	0.00	17.33±1.92	0.00
Exploratory	3.66±1.33^b	17.78±1.11^c	4.00±1.11^b	0.00^a

Means across columns bearing different superscripts differ significantly (P<0.05)

Discussion

It is important to understand the effect of light on the behavior of broilers as it can directly lead to changes in bird performance as was also well documented by Deep [4]. The various behavioural pattern observed have a marked effect on their welfare as well. A notable finding of this study revealed that birds reared under blue and green light were more calm and relaxed while as those reared under red or yellow light found to have aggressiveness. Among various behavioral responses the blue (G_1) and green (G_2) groups exhibited more of calm and comfort behavior, the case was reverse in case of blue (G_3) and green (G_4) group. It has also been documented by Prayitno *et al*., [15] that green or blue light induced a calming effect on birds and they spent relatively more time in sitting or dozing and, more of comfort behavior was observed with no sign of violence. Blue light has been found to reduce activity compared to white, green, or red light (Levenick and Leighton, [12] in turkeys while as Philips *et al*., [14] also demonstrated varying effects of blue, green, red, or white light on tissue growth and bird behavior. Light of different wavelength has varying stimulatory effects on the retina and can result in behavioral changes that will affect growth and development as reported by Lewis and Morris, [11]. Therefore Light colour has been considered a powerful management tool and used for mitigating several stressors in broilers by expressing many physiological, immunological and behavioral pathways documented by Lewis and Morris [10], Xie *et al*., [20].

Not only colour but intensity also has an important role in affecting the behavior of birds. It has well reported by Hester *et al*., [8], Kjaer and Vestergaard [9] that with increased light intensity the bird activity and aggressive behavior increases. Broilers are more active in brighter light and also move from the dim to the brighter light reported by Classen [2]. Lewis *et al*., [10] found greater incidence of injurious pecking (particularly wing pecking) and higher losses in male turkeys maintained from 20 days of age at 10 lux vs 1 lux incandescent light. To reduce skeletal and cardiac health problems, the poultry industry is using modern electronic systems to regularly increase light intensity for short periods of time during the broiler production reported by Classen, [2]. Light management has been shown play a part in reducing cannibalism in poultry Olanrewaju *et al*., [13], it is thought that photo stimulation helps to regulate normal behavior, and social interaction, as well as healthy circadian rhythms (Hartwig and Veen [7].

Conclusion

The thrust upon rearing of birds under different colours of light found to be fruitful in exploitation the expression of behavior and welfare of birds. Birds under study were provided blue light, green light, red light and plain incandescent light, respectively upto (6wks). Results revealed that birds reared under blue and green light were more calm and relaxed while as those reared under red or yellow light exhibited aggressiveness.

References

1. Bizeray D, Leterrier C, Constantin P, Le Pape G, Faure JM. Typology of activity bouts and effect of fearfulness on behaviour in meat-type chickens, 2002.
2. Classen HL. Barn of future lighting programme. http://www.gov.on.ca. 2000, Dated 14/7/2004
3. Classen HL. Day length affects performance, health and condemnations in broiler chickens. Proc. of the Australian Poultry Science Society, University of Sydney, Sydney, NSW, 2004.
4. Deep AK, Schwean-Lardner TG, Crowe BI, Fancher HL. Classen. Effect of light intensity on broiler production, processing characteristics, and welfare Poultry Science. 2010; 89(11):2326-2333
5. Duncan DB. Multiple range test and F-test. Biometrics.

1955; 11:1-42.
6. European Commission The welfare of chickens kept for meat production (broilers) Report of the Scientific Commission on Animal Health and Animal Welfare. European Commission Report B3, R15, P Unit B3, Directorate B of European Commission, Brussels, Belgium, 2000.
7. Hartwig HG, van Veen T. Spectral characteristics of visible radiation penetrating into the brain and stimulating extraretinal photoreceptors. Journal Comperative Physiology. 1979; 130:277-282.
8. Hester PY, Sutton AL, Elkin RG. Effect of light intensity, litter source and litter management on the incidence of leg abnormalities and performance of turkey toms. Poultry Science. 1987; 66(4):666-675.
9. Kjaer JB, Vestergaard KS. Development of feather pecking in relation to light intensity. Applied Animal Behaviour Science. 1999; 62:243-254.
10. Lewis PD, Morris TR. Responses of domestic poultry to various light sources. World's Poultry Science Journal. 1998; 54(1):7-25.
11. Lewis PD, Morris TR. Poultry and colored light. Poultry Science. 2000; 56(3):189-207.
12. Levenick CK, Leighton AT. Effect of photoperiod and filtered light on growth, reproduction and mating behavior of turkeys. Growth performance of two lines of males and females. Poultry Science. 1988; 67(11):1505-1513.
13. Olanrewaju HA, Thaxton JP, Dozier III, Purswell JL, Rous WB, Branton SL. A review of lighting programs for broiler production. International Journal of Poultry Science. 2006; 5(4):301-308.
14. Philips JP, Fischer GJ, Morris GL. Color pecking preferences in chicks. Comperative Physiological Psychology. 1997; 88(1):402-406.
15. Prayitno DS, Philips CJC, Omed H. The effect of color of lighting on the behavior and production of meat chickens. Poultry Science. 1997; 76(3):452-457.
16. Prescott NB, Jarvis JR, Wathes CM. Light, vision and welfare of poultry. Animal welfare. 2003; 12:269-288.
17. Snedecor GW, Cochran WG. Statistical methods. 7thEdition, lowa State university press, Ames, Iowa, 1980.
18. Vandenberg C, Widowski TM. Hens preferences for high- intensity high pressure sodium or low-intensity incandescent lighting. Journal Applied Poultry Science. 2000; 9:172-178
19. Wood-Gush DGM. Maintenance Behaviour. In The Behavior of Domestic Fowl. pp. Heinemann Educational Books Ltd., London, UK, 1971, 91-109.
20. Xie D, Wang ZW, Dong YL, Cao J, Wang JF, Chen JL *et al*. Effects of Monochromatic Light on Immune Response of Broilers. Poultry Science. 2008; 87:1535-1539.