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RESEARCH ARTICLE

STRATEGIC LIGHTING AND REST FOR ETHICAL POULTRY PRODUCTION IN BANGLADESH AND ITS IMPACT EVALUATION ON THE PERFORMANCE OF COMMERCIAL BROILERS

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ABSTRACT

The experiment was conducted at Boilor, Trishal, Mymensingh, Bangladesh to examine the effects of a strategic lighting from age day 3 to 4 weeks of production trial on the performance of broiler compared with a continuous 24-hour lighting schedule (control). The chicks were reared under open shed house in rural condition in two separate houses (hereafter mentioned as House -1 and House-2) maintaining the standard broiler management practices. During the whole experimental period, House – 1, broilers were exposed to a lighting regime 1-3 days 24 hrs, 4-8 days 23 hrs, 9-14 days 22 hrs, 15-21 days 22 hrs and 22-28 days 20 hrs light was maintained. In House -2, 24 hours lighting was confirmed. Weekly observations were recorded for live body weight, mortality percentages, weekly body weight gain, weekly feed consumption, and feed conversion ratio of birds for four weeks. The treatment group had a yield BWG and FCR better than the control birds at 4 week. The other performance parameter (the ADG, cumulative mortality, carcass yield and weight of giblets) were also better. Hence the net profit was more in the treatment group. We also observed the behavioral changes in the birds and found that the birds in the treatment group had a greater degree of sociality and comfort which is the key indicator for ethical production. Although we did not measure the comfort by the changes in the behavior but it can easily said that the changes comes from rest provided. The strategic lighting program tended to have more natural daytime behavioral patterns in broilers, to reduce fearfulness (and thus psychological stress), and to increase sociality. We conclude that the treatment group had a better welfare status than control birds without affecting broiler performance even yielding better results.

INTRODUCTION

Commercial broiler industry is committed to supply Bangladesh with a cheap source of good quality animal protein (Akter and Uddin, 2009). It has reduced the dependence on beef and mutton as animal protein sources (Islam *et al.,,* 2014). The body weight is the most important economic trait in poultry, because modern strains of broilers can easily reached at market weight within 28-32 days with good efficiency. It is not only influenced by genetics but also influenced by intensive management system (Feeding, lighting, temperature etc.).

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Broiler farmers of Bangladesh believe that only this intensive management system is the way to grow broiler efficiently. As such they are not ready to give their birds rest. They think the birds are only eat, drink, sleep and grow. So they left aside the ethical practice of giving rest to the broilers. Moreover, this fast growth attributable is associated with a higher incidence of as-cites and skeletal deformities, which often reduces the performance and welfare of broilers (Julian, R. J. 1998). Many consumers believe that commercial poultry rearing by conventional confinement systems leads to animal stress, resulting in negative physiology which is contradictory to the animal welfare concept. Animal welfare concept are increasingly attracting consumers attention worldwide (Ying Li *et al.,* 2016). Lewis P. and Morris T. 2006 stated that, light intensity not the length is one of the most important

environmental factors affecting broiler performance and physical activity. Traditionally, broilers have been subjected to continuous or nearly continuous light to maximize growth and feed intake; however, shorter day lengths or alternative programs are now being considered because of welfare concerns and possible energy savings. More importantly this alternative programs has not alter the broiler performance (growth rate, FCR, weight gain etc.).

MATERIALS AND METHODS

The experiment was conducted at Boilor,Trishal Mymensingh. The chicks were reared under open shed house in rural condition in two separate houses (hereafter mentioned as House -1 and House-2) maintaining the standard broiler management practices described by Sarker *et al.,* 2001.

Lighting Management

In the experimental period House -1 and House-2 lighting time is not maintained equally to know the impact of lighting time on growth performance. During the whole experimental period, House – 1, broilers were exposed to a lighting regime 1-3 days 24 hrs, 4-8 days 23 hrs, 9-14 days 21 hrs, 15-21 days 22 hrs and 22-28 days 20 hrs light was maintained. In House - 2, 24 hours lighting was confirmed.

Bio-security Measures

Adequate hygienic measures and appropriate sanitation programmers were carried out during the experimental period. The experimental area was strictly protected against the entry of unnecessary visitors. Hand spray and foot bath was used before enter into the houses. House equipment's and tools was washed, sprayed & fumigated before entering into the house. Hygienic management of feeding, watering, vaccination programs and litter management were taken during the experimental period. Disinfectants (aldekol, GPC 8, Dettol and Bleaching powder) were regularly sprayed on the road and surroundings of the experimental area to prevent outbreak of diseases.

Design of Experiment

A total of 1000 day old COBB -500 broiler chicks were procured from the hatchery of CP Bangladesh Comp Ltd., in Dhaka. Birds were randomly distributed in two treatments each considering four replications and 125 chicks in each replication. Weekly observations were recorded for live body weight, mortality percentage, weekly body weight gain, weekly feed consumption, and feed conversion ratio of birds for four weeks. All chicks were reared in the farm but in separate shed maintaining similar feeding regime, vaccination schedule and brooding temperature. Duration of lighting was different as described earlier.

Statistical Procedure

All recorded and calculated data were analyzed by using analysis of variance (ANOVA) technique and Mean comparison using Duncan's Multiple Range Test (DMRT), were conducted in R software version R.3.2.3 (Package "Agricolae").

RESULTS AND DISCUSSIONS

The LWG, ADG, and FCR of broilers reared under different lighting regimens, and at different ages, are shown in Table 1, Table 2 & Table 3 and ab shows significant differences between groups.

Table 1. Live weight gain (g/bird) in different weeks in two house

Week	Mean ± SD		Level of Significance
	House 1	House 2	
1st	183±4.76[a]	170±8.83[b]	*
2nd	454±7.83[a]	410.5±9.88[b]	*
3rd	890±8.48[a]	770.5±19.95[b]	*
4th	1277±12.35[a]	1182±17.96[b]	*

[ab] Means with different subscripts in the same row differ significantly at *= Significant (P<0.05),NS=Non Significant

Table 2. ADG (g/day) in different weeks in two houses

Week	Mean ± SD		Level of Significance
	House 1	House 2	
1st	0.026±0.001[a]	0.024±0.001[b]	*
2nd	0.0325±0.005[a]	0.0295±0.0005[b]	*
3rd	0.042±0.005[a]	0.0367±0.0009[b]	*
4th	0.0455±0.0005[a]	0.0425±0.0005[b]	*

[ab] Means with different subscripts in the same row differ significantly at *= Significant (P<0.05),NS=Non Significant

Table 3. Feed Conversation Ratio in different weeks in two houses

Week	Mean ± SD		Level of Significance
	House 1	House 2	
1st	0.98±0.055a	099±0.117[a]	NS
2nd	1.23±0.049[a]	1.24±0.071[a]	NS
3rd	1.29±0.021[b]	1.43±0.062[a]	*
4th	1.38±0.045[b]	1.46±0.045[a]	*

[ab] Means with different subscripts in the same row differ significantly at *= Significant (P<0.05),NS=Non Significant

The mortality pattern shown in Table 4 has significant difference between groups may be due to less stress faced by the birds in the treatment group.

Table 4. Mortality (%) of two houses in different weeks

Week	Mean ± SD		Level of Significance
	House 1	House 2	
1st	0.67±0.079[b]	1.02±0.11[a]	*
2nd	1.05±0.05[b]	1.75±0.139[a]	*
3rd	1.45±0.1[b]	2.44±0.189[a]	*
4th	2.13±0.067[b]	3.35±0.17[a]	*

[ab] Means with different subscripts in the same row differ significantly at *= Significant (P<0.05),NS=Non Significant

Total feed consumption was 1.76 and 1.72 kg/bird for birds in the treatment group and control group, respectively, and there was no difference between groups at first week but as the day goes the differences has gone up and reaches to a significant level (Table 5).

Week	Mean ± SD		Level of Significance
	House 1	House 2	
1st	180±5.66[a]	168±12.62[a]	NS
2nd	556±13.37[a]	507±17.37[b]	*
3rd	1150±8.68[a]	1100.75±19.72[b]	*
4th	1762±41.98[a]	1728.25±27.30[b]	*

[ab] Means with different subscripts in the same row differ significantly at *= Significant (P<0.05),NS=Non Significant

The carcass yield of the two groups of bird differs significantly as shown in Table 6. All the body parts differ significantly indicating that the birds in the treatment groups utilize the feed nutrient more efficiently.

practice ethical. The practice is profitable too as reviled from the study. The observed behavioral improvement needs to be quantified by a new and separate study.

Table 6. Carcass yield and relative weight of giblets (g/100 gm body wt.) of broilers at four weeks

Parameter	Mean ± SD		Level of Significance
	House 1	House 2	
Dressing percentage	68.15±0.31[b]	66.57±0.43[a]	*
Breast	23.425 ± 0.422	21.372± 0.705	*
Thigh	19.208 ± 0.622	17.455 ± 0.528	*
Drumstick	9.732 ± 0.133	7.625 ± 0.136	*
Abdominal fat weight	1.62±0.014	1.83±0.008	*
Intestinal weight	2.96±0.012	2.78±0.021	*

[ab] Means with different subscripts in the same row differ significantly at *= Significant (P<0.05),NS=Non Significant

Table 7. Total Performance of Broiler in two houses

Parameter	Mean ± SD		Level of Significance
	House 1	House 2	
Body weight (g/b)	1277±12.35[a]	1182±12.96[b]	*
Feed intake (g/b)	1762±41.98[a]	1728±27.31[b]	*
Mortality (%)	2.13±0.07[b]	3.35±0.17[a]	*
FCR (%)	1.37±0.046[b]	1.46±0.045[a]	*
EEF (%)	324.00±14.04[a]	279.25±13.37[b]	*
ADG (g/day)	0.045±0.0005[a]	0.042± 0.0005[b]	*

[ab] Means with different subscripts in the same row differ significantly at *= Significant (P<0.05),NS=Non Significant

Table 8. Cost benefit analysis

Parameter	Mean ± SD		Level of Significance
	House 1	House 2	
Chick cost (Tk/chicks)	38±0[a]	38±0[a]	NS
Feed cost (Tk/bird)	74.002±1.527[a]	72.587±0.995[a]	NS
Feed cost (Tk/kg bird)	58.013±1.723[b]	61.43±1.645[a]	*
Vitamin cost (Tk/bird)	0.25±0[b]	0.27±0[a]	*
Litter cost (Tk/kg bird)	2.58±0[a]	2.58±0[a]	NS
Vaccination cost (Tk/bird)	0.23±0[a]	0.23±0[a]	NS
Labour cost (Tk/kg bird)	6.22±0[a]	6.29±0[a]	NS
Lamp cost (Tk/kg bird)	1.18±0[a]	1.18±0[a]	NS
Electrical cost (Tk/kg bird)	6.1±0[a]	6.21±0[a]	NS
Miscellaneous cost (Tk/bird)	2.08±0[a]	2.15±0[a]	NS
Total cost (Tk/bird)	130.59±1.489[a]	129.497±0.995[a]	NS
Total cost (Tk/kg bird)	102.285±2.019[b]	109.582±2.279[a]	*
Sale price (Tk/kg bird)	115±0[a]	115±0[a]	NS
Net profit(Tk/kg bird)	12.715±2.019[a]	5.417±2.279[b]	*

[ab] Means with different subscripts in the same row differ significantly at *= Significant (P<0.05),NS=Non Significant

All the conventional parameter of performance the birds of control groups performs lesser than the treatment group (Table 8) which ultimately was reflected on the final profit calculated (Table 7).

It is worth mentioning that the fixed costs (DOC, feed, labor, depreciation, treatment & vaccination) were fixed to both the groups and hence has no significant difference (Table 8). Though the electrical cost shows no significant difference but it can easily be said that the house in the control consumes more electricity as lamps were lighted more there.

Conclusion

Light-restricted broilers had exhibited better Live weight gain at marketing age or at 4 wk, with better yield BW, feed consumption and FCR than control birds. It is observed that, the strategic lighting leads to more synchronized behavioral patterns with control birds. The birds of treatment group's birds were reduced in fearfulness and thus psychological stress and have a greater degree of sociality, which may have decreased their susceptibility to social stress and make the

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