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Effect of Photoperiod on the Production Performance and Carcass Quality Traits of Turkey Poults

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ABSTRACT

A study was conducted to assess the effect of photoperiod on production performance, development of digestive organs and carcass quality traits of turkey poults. One hundred and forty four, one week old turkey poults of Small white variety were distributed into three treatment groups, each comprising of three replicates of 16 poults. T-1 poults were subjected to conventional lighting programme (16L: 8D), T-2 poults were subjected to continuous lighting programme (24L: 0D) and T-3 poults were subjected to intermittent lighting programme (16L: 3D:2L: 3D). It was found that the average weekly body weight gain of T-2 poults were significantly higher ($P<0.05$) than T1 during 2nd week and 3rd week of age. Further, body weight gain of T-2 poults was numerically higher than the other two treatment groups till 9th week of age. FCR was significantly better ($P<0.05$) in T-2 compared to other two treatment groups during 2nd week and 3rd week of age. Further, FCR was significantly better ($P<0.05$) in T-2 compared to control group during 4th week of age and apparently better compared to the other two treatment groups throughout the experiment. Percent dressing yield of the birds reared in continuous and intermittent lighting programme was found to be significantly higher ($P<0.05$) than that of birds reared in conventional lighting programmes. Hence, it may be concluded that turkey poults maintained on a continuous lighting program during their early growth phase may elicit higher body weight gain and better feed conversion ratio than other lighting regimen.

Keywords: Body weight gain, carcass quality, photoperiod, turkey

Vision is an important factor that determines poultry behaviour and welfare. Birds have highly specialized visual systems and the majority of their behaviour is mediated by vision (Collins *et al*., 2011). Lighting is one of the powerful and critical environmental factors, which control vision and thereby many physiological and behavioral processes in the birds. Circadian (daily) rhythms in activity and metabolism are well recognized in diurnal poultry species (Classen, 2004). Light allows birds to establish rhythmicity and synchronize many essential functions including body temperature and various metabolic steps that facilitate feeding, digestion and control growth, maturation and reproduction (Janczak and Riber, 2015). As an environmental factor, light consists of three different aspects *viz.* intensity, wavelength and photoperiod (Manser, 1996). Light intensity, color and photoperiodic regime can affect the physical activity of broiler chickens (Lewis and Morris, 1998). Photoperiod i.e. light duration is the second major aspect of light after intensity that can alter bird's performance. When photoperiod is maintained at a constant level throughout the growth cycle of broiler chickens, shorter day length is associated with slower growth (Li *et al.*, 1995). The slower growth rate is a reflection of reduced feed intake associated with shorter day and reduced leg abnormalities (Gordon, 1994). In the past, studies on photoperiod have been limited to chickens. In order to meet the genetic potential of growth in turkeys, there is a need for farmers to use best husbandry and management practices (Case *et al.*, 2010). Hence, a study was undertaken to assess the

effect of photoperiod on the production performance, development of digestive organs and carcass quality traits of turkey poults.

MATERIALS AND METHODS

Experimental birds and treatments

One hundred and forty four day old turkey poults were distributed into three treatment groups, each comprising of three replicates of 16 poults. T-1 poults were subjected to conventional lighting programme, 16 hours photophase and 8 hours scotophase (16L: 8D), T-2 poults were subjected to continuous lighting programme (24L: 0D) and T-3 poults were subjected to intermittent lighting programme (16L: 3D:2L: 3D). During the experimental period, the poults were provided *ad lib* turkey starter ration up to 8 weeks (wk) of age (NRC, 1994) and there after turkey grower ration till 12 wks of age (NRC, 1994). The birds were reared on deep litter system and natural light was provided during the day time and after that artificial light with incandescent bulbs was given maintaining at least 40 lux light in every corner of the house.

Production indices

Weekly body weight gain, feed consumption and feed conversion ratio (FCR) were determined till 12 weeks of age.

Development of gastrointestinal tract and carcass quality traits

After 12 wks of age, 4 birds (2 male and 2 female birds) from each treatment group were sacrificed to study the development of gastrointestinal tract and various carcass quality traits *viz*. pre-slaughter fasting shrinkage in live weight (%), dressing(%), eviscerated weight (%), giblet yield (%) and yield of cut-of-parts (thighs, drumsticks, breast, back, neck and wing).

Statistical analysis

Data obtained from the above experiment were subjected to one way analysis of variance in a completely randomized design (Snedecor and Cochran, 1994). Significant differences among treatment means were calculated as per Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Production indices

Average weekly body weight gain of the birds reared in continuous and intermittent lighting programmes at 2nd wk was significantly higher ($P<0.01$) than the average weekly body weight gain of the birds reared in conventional lighting programme (Table 1). At 3rd week, average weekly body weight gain of the birds reared in continuous lighting programme was found to be significantly higher ($P<0.05$) than the average weekly body weight gain of the birds reared in conventional and intermittent lighting programme. Further, body weight gain of T-2 poults was numerically higher than the other two treatment groups till 9th week of age. After 9 weeks of age, there was no clear trend and it appeared that the early decrease in body weight in T-1 and T-3 was compensated at the end of the experiment. Classen (2004) carried out a comparative study on lighting schedule 12L: 12D, 16L:8D, 20L:4D and concluded that longer periods of darkness limit growth in early life. Contrary to these findings, Meluzzi *et al.* (2007) observed that a short photoperiod of 16L: 8D did not affect broiler growth rate than those of birds kept with a conventional long period. In the present study, the growth rate was significantly higher in the continuous lighting programme as compared to the other treatment groups during the initial stages.

Thereafter, a non-significant higher growth rate trend was maintained in continuous lighting program as compared to the other two lighting regimens and in the final stages of rearing, a better body weight gain was observed in birds getting lesser photoperiods. These results are in agreement with other studies (McDaniel *et al.*, 1977; Malone *et al.*, 1980; Cave *et al.,* 1985; Simmons, 1986; Buyse and Decuypere, 1988), who noted that the initial reduction in body weight gain of birds under intermittent lighting conditions is followed by compensatory growth. Average weekly feed consumption was significantly higher ($P<0.01$) in T-1 and T-3 as compared to T-2 at 2nd week of age (Table 2). Further, average weekly feed consumption was significantly higher ($P<0.05$) in T-1 and T-3 as compared to T-2 at 12th week of age. However, average weekly feed consumption was comparatively higher in T-2 than T-1 and T-3 during 6 to 9th week of age. Similar trend of increased feed intake was observed

Table 1: Effect of lighting program on the average weekly body weight gain (g) of growing turkey poults

Treatment	2nd wk	3rd wk	4th wk	5th wk	6th wk	7th wk	8th wk	9th wk	10th wk	11th wk	12th wk
T-1	24.87[b]	25.99[b]	37.20	66.00	104.47	106.47	112.67	126.61	160.75	124.38	149.96
T-2	31.27[a]	36.85[a]	47.01	75.41	109.42	113.92	119.83	139.64	158.47	148.42	123.74
T-3	30.56[a]	26.58[b]	35.82	66.03	96.00	94.10	101.81	122.48	134.90	128.05	156.19
SEM	1.08	2.16	2.35	4.86	3.90	4.04	3.93	6.07	7.62	6.84	7.07
Sig level	P<0.01	P<0.05	NS	NS	NS	NS	NS	NS	NS	NS	NS

Means bearing different superscript within a column differ significantly (P<0.05); NS: Not significant (P>0.05). SEM: Pooled standard error of means.

Table 2: Effect of lighting program on the average weekly feed consumption (g) of growing turkey poults

Treatment	2nd wk	3rd wk	4th wk	5th wk	6th wk	7th wk	8th wk	9th wk	10th wk	11th wk	12th wk
T-1	70.33[a]	86.33	146.93	162.19	205.33	234.85	274.59	362.53	515.48	483.63	608.11[a]
T-2	50.00[b]	69.16	105.54	153.32	215.51	257.72	308.61	391.25	468.46	416.87	454.98[b]
T-3	71.94[a]	87.55	113.17	139.91	184.29	214.57	272.77	324.47	429.92	410.81	625.05[a]
SEM	3.85	5.07	9.26	6.74	8.91	13.04	12.49	14.96	25.80	17.00	33.02
Sig level	P<0.01	NS	NS	NS	NS	NS	NS	NS	NS	NS	P<0.05

Means bearing different superscript within a column differ significantly; NS: Not significant (P>0.05). SEM: Pooled standard error of means.

Table 3: Effect of lighting program on the average weekly FCR of growing turkey poults

Treatment	2nd wk	3rd wk	4th wk	5th wk	6th wk	7th wk	8th wk	9th wk	10th wk	11th wk	12th wk
T-1	2.83[a]	3.33[a]	3.96[a]	2.62	1.96	2.19	2.43	2.87	3.20	4.00	4.04
T-2	1.59[c]	1.87[b]	2.23[b]	2.09	1.97	2.25	2.57	2.86	2.98	2.85	3.75
T-3	2.35[b]	3.38[a]	3.21[ab]	2.13	1.93	2.28	2.67	2.65	3.19	3.22	4.02
SEM	0.18	0.30	0.29	0.19	0.05	0.06	0.06	0.09	0.11	0.25	0.16
Sig level	P<0.01	P<0.05	P<0.05	NS	NS	NS	NS	NS	NS	NS	NS

Means bearing different superscript within a column differ significantly; NS: Not significant (P>0.05). SEM: Pooled standard error of means.

by Korde *et al.* (2007) in broilers and it was observed that the feed consumption was not significantly affected in the 2nd and 3rd week of age by photoperiods, but in the 4th,5th and 6th week, the feed intake (kg/bird/week) was higher in birds having longer photoperiods. FCR was significantly better (P<0.05) in T-2 compared to the other two treatment groups during 2nd week and 3rd week of age (Table 3). Further, FCR was significantly better (P<0.05) in T-2 compared to the control group during 4th week of age. Further, FCR was apparently better in T-2 compared to the other two treatment groups throughout the experiment. Contrary to these, Meluzzi *et al.* (2007) and Korde *et al.* (2007) observed that a short photoperiod results in better feed efficiency than those of birds kept with a long period whereas, Classen *et al*. (2004) reported that feed conversions were higher for 12L: 12D and two 6L: 6D periods per each 24 h period than 12 (1L:1D) periods per each 24 h period.

Development of GIT and carcass quality traits

There was no significant difference in the development of GIT among the different treatment groups at 12 weeks of age (Table 4).

Percent dressing yield of the birds reared in continuous and intermittent lighting programme was found to be significantly higher (P<0.05) than that of the birds reared in conventional lighting program (Table 5). This may

Table 4: Effect of lighting program on the development of digestive organs of turkey poults at 12 weeks of age

Treatment	Proventriculus weight (g)	Small intestine length (cm)	Small intestine weight (g)	Large intestine length (cm)	Large intestine weight (g)	Average caecal length (cm)	Average caecal weight (g)
T-1	0.37	10.89	2.39	0.61	0.18	1.53	0.62
T-2	0.39	10.50	2.39	0.64	0.21	1.44	0.51
T-3	0.43	11.75	2.80	0.76	0.27	1.66	0.54
SEM	0.01	0.32	0.12	0.05	0.02	0.04	0.04
Sig level	NS	NS	NS	NS	NS	NS	NS

NS: Not significant (P>0.05). SEM: Pooled standard error of means.

Table 5: Effect of lighting program on the carcass quality characteristics and giblets of turkey poults at 12 weeks of age

Treatment	Processing shrinkage (%)	Dressing (%)	Eviscerated weight (%)	Heart (%)	Liver (%)	Gizzard (%)
T-1	4.65	71.99^{b}	54.15	0.43	1.66	3.80
T-2	4.78	74.93^{a}	56.89	0.41	1.80	4.02
T-3	4.27	74.05^{a}	54.23	0.40	1.85	4.88
SEM	0.36	0.44	0.62	0.01	0.06	0.29
Sig level	NS	P<0.05	NS	NS	NS	NS

Means bearing different superscript within a column differ significantly; NS: Non significant (P>0.05). SEM: Pooled standard error of means.

Table 6: Effect of lighting program on the cut up-parts as per cent of eviscerated weight of turkey poults at 12 weeks of age

Treatment	Thighs (%)	Drumstick (%)	Breast (%)	Back (%)	Neck (%)	Wings (%)
T-1	16.25	15.72	28.86	18.42	6.34	14.41
T-2	15.77	15.87	30.52	16.69	5.69	15.45
T-3	16.35	16.11	29.83	17.20	5.42	15.08
SEM	0.15	0.22	0.35	0.40	0.22	0.26
Sig level	NS	NS	NS	NS	NS	NS

NS: Non significant (P>0.05). SEM: Pooled standard error of means.

be due to the fact that in our experiment, the final body weight of the birds reared in continuous and intermittent lighting programmes was higher than that of the birds reared in conventional lighting programme. Further, no significant differences were found among the treatment groups for other carcass traits *viz*. processing shrinkage, percent eviscerated yield and percent giblet yield (heart, liver and gizzard). In addition, no significant differences were found among the treatment groups for individual cut-up parts as percent of live weight (Table 6). Similar results have also been reported by Fidan *et al*. (2017) who stated that photoperiod had no effect on meat quality traits.

Contrary to this, Schwean-Lardner *et al*. (2006) observed that breast meat yield increased linearly as rearing photoperiod treatments were increased in 3-h increments from 14L:10D to 23L:1D. Case *et al*. (2010) in their study on factors affecting breast meat yield in turkeys, found that a light cycling program with a daily set light and dark periods is associated with higher breast meat yield values compared to frequently alternating light and dark periods throughout the day in an intermittent lighting regime.

CONCLUSION

Thus, it may be inferred from the study that turkey poults maintained on a continuous lighting program during their early growth phase may elicit higher body weight gain and better feed conversion ratio than other lighting regimen.

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