EFFECT OF LIGHT RESTRICTION ON THE PERFORMANCE OF BROILERS FED CONVENTIONAL AND NON CONVENTIONAL GROWTH PROMOTERS

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ABSTRACT

This study was performed to investigate the effect of light restriction (RL) on performance of broilers fed conventional and non conventional growth promoters. One hundred and eighty day-old broiler chicks were randomly distributed into four groups (A, B, C and D), each having five replicates. The experimental period was 42 days and all the birds were reared in an open house. Groups A and B were reared under continuous light and given diet containing conventional (Zinc bacitracin: 0.5 gms/kg of feed) and non conventional growth promoters (Botanical growth promoter 1 (B.G.P 1):1 gms/kg of feed), respectively. Group C and D received regular light (RL: 20 hrs light and 4 hrs dark) and were fed same conventional and non conventional growth promoter, respectively. Weight gain, feed intake and FCR were not affected by either LR or feeding conventional and non-conventional growth promoters. However, microbial count was higher in groups fed diets containing conventional growth promoters as compared to those given non conventional growth promoters. Significantly higher (P<0.05) mortality was found in group A (8.8%) compared to C (6.6%), B (4.4%) and D (0%). Light restriction didn't affect growth performance of the broilers, yet overall economic performance was improved due to reduced mortality and cost of electricity.

Key Words*: Broilers, Light restriction, Conventional and non-conventional growth promoters*

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INTRODUCTION

Light is one of the important parameters of broiler production. A wide variety of lighting programs (wavelength, intensity, and duration) are being used owing their significance with respect to growth and cost of broiler production. The potential for changing photoperiods to influence broiler performance, is receiving considerable attention due to cost of production and associated metabolic disorders. Some lighting programs are adopted for slowing the early growth rate of broilers thus allowing birds to achieve physiological maturity before maximal rates of muscle mass accretion (Olanrewaju *et al* 2006). Broilers are generally reared under continuous illumination with the assumption to ensure maximum feed consumption and accelerated growth. This practice, however, may not lead to better feed conversion and economic returns as has also been stated by Renden, *et al.* (1991). The authors reported no significant effect of reduced length of light period on weight gain in broilers. Apeldoorn *et al (*1999) also reported that birds provided with sufficient dark periods had fewer health related problems, including sudden death syndrome, spiking mortality and leg problems than those maintained in continuous or near continuous light. Livability, average body weight, feed conversion rate, and percentage condemnations were improved in broilers exposed to restricted photoperiods, as compared to those subjected to continuous light (Classen *et al*., 1991; Classen, 2004a).

The increased feed prices, fuel/energy higher rates of mortality have further narrowed the gap between cost of production and returns. Efforts are made to reduce cost of production and ensure healthy production thereby avoiding associated residual risk and mortality in broilers. Several vaccination programs and hygienic measures are taken to avoid stress and diseases resulting in higher mortality. Beside vaccination and hygienic measures, several antibiotics and other synthetic chemical compounds have been added to broiler rations that have resulted in better growth. Such additives are not only costly, the recent human health related issues with the use of such promoters has opened a door for the use and identification of some conventional and non-conventional growth promoters that will not only address the human health issues, could reduce feed cost several folds. Ismail *et al*. (2004), Chand *et al*. (2005) and Durrani *et al*. (2006) have reported better production performance and increased immunity level of

broilers to Infectious bursal disease, infectious bronchitis and coccidiosis fed various herbal extracts and or feed additives. Lin and Song (1989) also reported that the toxicity produced by antimicrobial growth promoters can be prevented with herbs. Keeping in view the aforementioned discussion, the present study was designed to study the effect of RL, conventional and non-conventional growth promoters on the overall performance of broilers.

MATERIALS AND METHODS

One hundred and eighty day old broiler chicks (Hubbard) were purchased from a local commercial hatchery. All the chicks were initially weighed and randomly divided into four groups (A, B, C & D). Each group had five replicates, with nine chicks each. Groups A and B were reared under continuous light and were fed diet containing conventional (Zinc bacitracin: 0.5 gms/kg of feed) and non conventional (Botanical growth promoter 1 (B.G.P 1: 1 gms/kg of feed), respectively, whereas groups C and D received RL (20 hrs light and 4 hrs dark) and fed with the same conventional and non conventional growth promoters as shown in Table I. The birds were reared in two compartments of the same building, separated by a thick corrugated paper that didn't allow the light to pass, where they received two different lighting regimens as shown in the Table I. The growth promoters were mixed in feed at the time of feed processing. The ingredients of BGP 1 are given in Table II. The chicks were kept on floor under all standard conditions of animal husbandry throughout the experiment. Commercial broiler starter and finisher diets were incorporated with conventional and non-conventional growth promoters and offered from one to four and five to six weeks, respectively. Body weight, feed consumption and feed conversion ratio were recorded weekly. At the end of six week experiment period about three inch segment of small intestine from gizzard was cut from two birds per replicate and was used to study microbial counts. Mortality was recorded as and when occurred and cost of production, return and net profit was also calculated. The data obtained was tabulated and subjected to one way analysis of variance using computer software Minitab® release 9 .2, Minitab INC, Clecom, Ltd, UK. The differences in means were compared by Duncan Multiple Range test.

RESULTS AND DISCUSSION

Feed Consumption, Body Weight Gain and Feed Conversion Ratio

Light restriction and feeding conventional and non-conventional growth promoters didn't influence ($P>0.05$) feed consumption, weight gain and feed conversion ratio of broilers (Table IV). Similar findings have been reported by Renden, *et al.* (1991), Ravindran, *et al.* (2006), Oyedeji and Atteh (2005), Smith (1994), Guo, *et al.* (2004), Rozenboim, *et al.* (1999) using variable light restriction programs. Findings of Eitan and Soller (2001), Apeldoorn *et al.* (1999), Classen *et al*. (1991), Classen, (2004a), Ingram and Hatten (2000) and Ketelaars *et al*. (1986) didn't confirm this study. The non-significant differences ($P>0.05$) amongst groups of broilers with respect to feed consumption, body weight and feed conversion ration revealed that RL and or feeding conventional and non-conventional growth promoter under RL could further be investigated narrowing the interval of light restriction and feeding variable levels of growth promoters of the same kind to a large number of groups.

Table I. ***Experimental design to study the effect of light restriction on the performance of broilers fed conventional and non conventional growth promoters***

Treatment	Groups	Growth promoter
Continuous Light	A	Conventional (Zn Bacitracin) @ 0.5gms/Kg
(24h light)	B	Non-conventional(Botanical growth promoter I) @ 1 gm/Kg
Restricted Light	C	Conventional @ 0.5gms/Kg
(20h Light + 4h Dark)	D	Non-conventional @ 1 gm/Kg

Table II. ***Contents of Botanical Growth Promoter 1 and its functions***

Botanical Name	Local name	Function
Andrographis paniculata	Falfal draz	Immunostimulant, Antibacterial, Carminative
Menthe arvensis	Fodanj	Carminative, Appetite stimulant, Antibacterial
Pimpinella anisum	Badian drazyana	Carminative, Antibacterial
Piper nigrum	Falfal seya	Immunostimulant, Appetite stimulant
Rheum emodi	Reewand khatai	Digestive and Liver tonic
Spindus Trifoliatus	Bunduk	Carminative, Antitoxin, Antibacterial
Zingiber officinalis	Zangebeel	Antioxidant,Carminative, Immunostimulant

Table III. ***Composition of broiler starter & finisher diet***

Ingredient (%)	Starter (Crumbs)	Finisher (Crumbs)
Corn	39.2	31.5
Rice	20	20
Wheat	--	8.0
Rice Polishing	1.5	5.74
Soya meal	17	13.66
Canola meal	9.76	9.99
Sunflower meal	3.62	2.08
Rapeseed meal	2.5	2.0
Fish meal	0	1.0
Di-calcium Phosphate	1.95	1.29
Molasses	2.5	2.92
Vitamin Mineral Premix	1.0	1.0
Chipps	0.66	0.5
Sodium Cholride	0.20	0.164
DL methionine	0.21	0.187
Total	100	100

Mortality and Microbial Count of the Gut

Feeding non-conventional growth promoters under RL significantly influenced mortality and number of clostridia count. Significantly higher ($P<0.05$) mortality (8.8%) and clostridia colonies (612) were found in group A than in group D (0% and 343, respectively; Table V). Similar findings have been reported by Rozenboim, *et al.* (1999), Lott, *et al.* (1996), Hassanzadeh, *et al.* (2003), Rahimi, *et al.* (2005) and Oyedeji and Atteh (2005) under light restriction programs in broilers. Birds provided with dark periods have also been reported to have fewer health related problems, including sudden death syndrome, spiking mortality and leg problems than those maintained in continuous or near continuous light (Apeldoorn *et al.*, 1999). The authors associated reduced level of mortality with melatonin produced during the dark hours as absence of melatonin have been found to result in higher mortality rate in birds reared under continuous light. Contrary to the present findings, Renden *et al.* (1991) reported no influence of restricted light on mortality in broilers. The low level of mortality and clostridia count under RL and non-conventional growth promoters could probably be due to the more desirable effect of non-conventional growth promoters against stress and microbial activities as non-conventional growth promoters had abundant levels of andrographis paniculata, Pimpinella anisum. Menthearvensis and Spindus triforliatus that have strong antibacterial properties. Murry *et al.* (2006) also reported that botanical probiotics reduced clostridium species at marketing age of broilers. Lower concentration of clostridium perferingens was found in broilers fed with botanical growth promoters (Enberge *et al.*, 2000). Thus, it's concluded that non-conventional growth promoters can be effectively used in broiler production to reduce mortality risks and cost of feed.

Table IV. ***Growth performance of birds over six week experimental period fed with conventional and non conventional growth promoters under different lighting schedules***

Treatment	Weight gain (g/chick)	Feed Intake (g/chick)	FCR
A	2131.50^{a}	4119.8^{a}	1.9^{a}
B	2223.80^{a}	4191.9^{a}	1.8^{a}
C	2107.77^{a}	4112.6^{a}	1.9^{a}
D	2140.87^{a}	4192.0^{a}	1.9^{a}

The means in the same column having similar superscripts are not significantly different ($P>0.05$)

Table V. ***Clostridia Count of the Gut & Mortality % of experimental birds fed on different treatments***

Treatment	Groups	Clostridia Count	Mortality %
Continuous Light & Conventional growth Promoter	A	612^{ab}	8.80^{a}
Continuous Light & Non-Conventional growth Promoter	B	359^{c}	4.40^{c}
Restricted Light & Conventional growth Promoter	C	884^{a}	6.60^{b}
Restricted Light & Non-Conventional growth Promoter	D	343^{c}	0^{d}

The means in the same column having different superscripts are significantly different at $P<0.05$.

Table VI. ***Comparative economic feasibility of birds fed on experimental rations***

Group	Total feed cost (Rs.)	Cost of electricity (Rs)	Cost/ Kg (Rs.)
A	2,459 [a]	22.5 [a]	40.00 [a]
B	2,528 [b]	22.5 [a]	38.15[b]
C	2,477[c]	20.25 [b]	39.78 [a]
D	2,554 [a]	20.25 [b]	37.52[b]

The means in the same column having different superscripts are significantly different at P<0.05.

Economic Performance

Overall economic performance was assessed on the basis of feed cost, electricity cost and cost per kilogram of body weight. Overall cost of production was significantly (P<0.05) higher in group A (Rs. 40.00/bird) than in group D (Rs. 37.52; Table VI). Similar trend was found in cost of electricity per group (Table VI). Findings of the present study were in agreement with that of Rahimi *et al* (2005) who reported reduced cost of electricity with restricted light program. As group D was kept on non-conventional growth promoters under RL thus, it would be a better option to use non-conventional growth promoters instead of antibiotics or other synthetic compound.

CONCLUSION AND RECOMMENDATIONS

Light restriction and use of two different growth promoters didn't affect growth performance of the broiler, however better economic gains were resulted because reduced cost of production in light restricted groups and the ones fed non-conventional growth promoters. A more elaborative research study on intermittent light regimen and identifying an optimal level of non-conventional growth promoters in future would be required for enhanced production and economic performance of broilers.

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