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QUAIL PERFORMANCE AND WELFARE AS AFFECTED BY LIGHT PROGRAMS

BY

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SUMMARY

The objective of this study was to compare between the effects of the intermittent lighting program consisting of 4 repeated cycles of 1 hour light : 3 hours darkness and a nearly continuous lighting program (23 hours light : 1 hour darkness) on the performance and welfare of quails.

The use of intermittent lighting has been shown to increase the final body weight and weight gain. It also reduced feed intake and improved feed conversion. The mortality rate was not affected by the lighting programs.

Quails reared under the intermittent light had low frequency of pecking, twisted legs and eye abnormalities and 100% perfect feather condition scores.

INTRODUCTION

Most farmers prefer to use nearly continuous lighting program, i.e. 23 h light (L) : 1 h darkness (D) [23 L : 1D], providing a daily short dark period in order to adapt the birds to darkness and hence to avoid panic in case of power failure. As birds normally eat during the light periods, it is believed that under continuous lighting conditions feed intake is at a maximum and hence growth rate. However, it must be recognized that this does not necessarily lead to the best bird performance nor the highest profit margins.

Body weight, weight gain and feed conversion of broilers provided varying light periods were equivalent to broilers provided continuous light if light was on at least 1h and off no more than 2 h (Dorminey, 1971). Weaver et al. (1982) and Johan (1997) found that body weight, weight gain and feed conversion were improved in broilers provided an intermittent lighting compared with continuous lighting.

A variety of lighting programs have been examined to improve livability and decreased pathophysiological dysfunctions (ascitis, sudden death syndrome, and leg problems) in broiler chickens (Wilson et al., 1984, Renden et al., 1991, Gordon, 1994 and Johan, 1997).

This study aimed the comparison of the effects of intermittent lighting program on the performance and welfare of quail with those of a nearly continuous lighting program.

MATERIAL AND METHODS

This study was carried out in Faculty of Veterinary Medicine, Moshtohor, Benha Branch , Zagazig University.

One hundred one - day old quail chicks were obtained from a commercial hatchery and placed in one floor pen (the floor area was 2.0 x 2.0 meters). The birds were reared on deep litter system. The temperature was set initially at 37°C and gradually reduced at a rate of 3°C / week until 25°C was reached. During their first two weeks of brooding, the quails were exposed to nearly continuous (23 hours light : 1 hour dark) artificial illumination from a 60 watt bulb which was suspended 2.20 m at head height of the birds. Light intensity at the level of the birds was measured according to Francis and Harvey (1976).

$I = Io^{e-\alpha x}$ where I is the intensity of light at the level of the bird, Io is the source intensity, α is the absorption coefficient and x is the distance between the source of light and the birds, so the light intensity used was approximately 2.66 lux / square meter per second. At 2 weeks of age, quails were randomly distributed over two light proof pens (The floor area was 1.00 x 2.00 meters). The pens were sufficiently ventilated through sided electric fans and extracting fans. In one pen, nearly continuous lighting program (23 h light : 1 h dark) was maintained, whereas in the other, the intermittent lighting program consisting of 1 h light : 3 h dark cycles beginning at 7.00 a.m. and repeated four times daily was imposed.

The birds were daily provided with water and a ration of broiler starter containing 28% protein ad libitum at 7.00 a.m and the residuals of feed were measured by weight back technique at 7.00 a.m in the next day. Ten birds from each group were randomly picked and identified. They were weighed weekly till the end of the experiment (6^{th} week of age). Body weight, Body weight gain, feed intake, feed conversion according to Deaton et al. (1978) and mortality percent were recorded.

The behavioural observations were performed according to the recommendation of Fraser and Broom (1990). The two groups were observed four times per day for three days weekly, each group was observed 60 minutes daily for recording the percent of birds that exhibited pecking.

At the end of the experiment, each bird was assigned according to a feather score (1 = fully feathered; 2 = bare wing bows, or bare neck or bare back; 3 = bare wing bows and bare backs; 4 = devoid of feathers), leg problem (twisted legs)

and eye abnormalities.

The statistical analysis was carried out according to Snedecor and Cochran (1982).

RESULTS AND DISCUSSION

Effect of lighting program on productive performance :

Body weight :

The influence of the lighting program on average body weight at 6 weeks of age is summarized in Table (1). Body weight at 6 weeks for quails of continuous light and of intermittent lighting averaged 156.51 +1.93 and 188.27+ 3.15 gm respectively. Significant effect of light treatment on body weight was observed. This resulted in a significantly increased body weight of quails reared under the intermittent light ($P < 0.01$). Reduced social stress and low physical activity during darkness are suggestive for the superior body weight recorded by the quails of intermittent light. Moreover, the birds reared under intermittent light may show much more resting behaviour than those under continuous light which all reduced the energy lost in such activities.

Differences in body weight due to exposure to different light programs have been reported by several investigators in other birds. Gore et al. (1969) concluded that an adequate dark period for inactivity following feeding plays a dominant role in broiler growth. Siopes et al. (1986) reported that tom turkeys under intermittent lighting were heavier than those reared under the continuous light. Johan (1997) found that the intermittent light resulted in an increase in final body weight at slaughter age in broilers.

Daily feed intake, weight gain and feed conversion:

The influence of light program on daily feed intake, daily body gain and feed conversion is summarized in Table (1). The obtained results showed that the daily feed intake for the quails reared under the intermittent light was lower than those reared under the nearly continuous light. Feed intake is a major factor in the evaluation of performance efficiency for both the meat and breeder components in the poultry industry. This is an important advantage of intermittent light program as feed costs represent at least 70% of the total production costs. Buyse et al. (1996) concluded that imposing intermittent light reduced feed intake and improved feed conversion in broiler.

With regard to daily body weight gain and feed conversion, the results showed that quails reared under the intermittent light showed greater weight gain and better feed conversion than the continuous light group. This improved body weight gain and feed conversion of intermittent light quails can be attributed to that physical activity is very low during darkness, and energy expenditure for activity is considerable, a reduction in physical activity with intermittent light may also contribute to enhanced production

Table (1) : Effect of lighing programs on average body weight , feed intake, weight gain , feed conversion and mortality in quails.

Item	Continuous light	Intermittent light
Body weight /g		
a- Initial at 2 wk	25.72 ± 0.34	25.42 ± 0.41
b- Final at 5wk	156.51 ± 1.93	188.27 ± 3.15*
Dailty feed intake / g	14.16	12.21
Weight gain/g	130.79	162.85
a- Total at 6wk	4.67	5.82
b- Daily	3.03	2.10
Feed conversion g.g	2.33 ± 0.03	2.27 ± 0.03

* Significant at P≤ 0.01

Table (2) : Effect of lighing programs on welfare problems in quails.

Item	Continuous light	Intermittent light
Pecking %	7.01 ± 0.41	2.08 ± 0.16*
Twisted leg %	5	2.38
Eye abnormalities %	6.67	2.22
Feather condition	82.22	100.00
a- Grade 1%	17.78	0.00

* Significant at P≤ 0.01

efficiency. In this respect, Dorminey (1971) reported that the body weight gain and feed conversion of broilers provided varying light periods were equivalent to broilers provided continuous light if light was on at least 1 hour and off no more than 2 hours, while Weaver et al. (1982) and Johan (1997) found that weight gain and feed conversion were improved in broilers provided an intermittent lighting compared with continuous lighting. On the other hand, Rowland (1985) concluded that a symmetrical intermittent light regimens generally resulted in no change in feed conversion in chickens. Thus, the benefits of intermittent light may be more pronounced for quail than chicken.

Mortality :

Concerning the average mortality, it was found that the average mortality of quails reared under the intermittent light was lower than those reared under the continuous light (Table 1) but the difference due to light programs was not significant. The effect of light programs on mortality rate seems to be in agreement with the work of Buyse et al. (1996) who showed that the overall mortality of broiler was low and was not affected by the lighting program.

Effect of lighting program on quail welfare :

The influences of the light program on pecking, twisted legs, eye abnormalities and feather condition are summarized in Table (2). Quails reared under the intermittent light had low frequency of pecking, twisted legs and eye abnormalities and 100% perfect feather scores (grade 1). On the other hand, it has been found clearly that exposing quails to nearly continuous light causes high frequency of pecking, twisted leg and eye abnormalities and 82.22% feather scores (grade 1).

The more frequency of pecking in birds reared under continuous light may be attributed to that the birds are subjected to more stress and higher level of sex hormones which may increase sexual excitation and consequently the aggression. Bacon and Nestor (1975) concluded that restriction of exposure to light to 8 or fewer hours per day delays sexual maturation in quails.

The difference in feather condition scores may be attributed to the incidence of pecking under different light treatments.

The application of intermittent lighting program reduces the incidence of twisted legs. This reduction may be attributed to the increased physical activity of birds during the photoperiod which may favour bone strength development. Renden et al. (1991), Gordon (1994), Johan (1997) and Balog et al. (1997) reported that the intermittent light had decreased the pathophysiological dysfunction (ascitis, sudden death syndrome and leg problems) in broiler.

The high frequency of eye abnormalities in quails exposed to continuous lighting may be attributed to the dusty environment in the pen that results from the activity of birds.

Results of this study emphasize the dynamic nature of the birdís interaction with its environment, while the differences in productive performance and behaviour can be attribued to light environments with varying biological activity. The results of the present study indicated that intermittent light can improve productive performance of quails and therefore also profitability. Furthermore, it has advantageous effect for welfare and alleviates environmental pollution. Additional favorable effects of inermittent light can be found in the reduction of electricity costs.

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