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# INFLUENCE OF PHOTOPERIOD AND SPACE DENSITIES ON THE PERFORMANCE OF BROILER CHICKS

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One hundred and eighty day-old broiler chicks were reared upto 7 weeks of age. They were provided different space densities of 1.0 and 0.8 sq. ft. bird$^{-1}$ with three photoperiods i.e. 24, 20 and 16 hours. The results revealed that different space densities and photoperiods had significant effect on body weight gain and feed consumption but cumulative effect was found to be non-significant while there was a significant ($P<0.01$) effect on feed conversion ratios when birds were reared in different space densities. It was observed that there was non-significant influence on FCR. When birds were reared under different photoperiods, the accumulative effect was non-significant.

## INTRODUCTION

In order to maintain human health, it is imperative that diet be adequate in essential nutrients. Among the nutrients, proteins especially of animal origin are of great significance. Broiler chicks are probably the best source of proteins and can convert the vegetable and animal wastes into biologically highly valued meat protein. Thus full attention should be given to the poultry industry, particularly the broiler chicks for making available quality nutrients to mankind. Among other factors, light regime and space density are the two important factors exerting influence on the broiler growth. Currently in Pakistan, 24 hours light system is prevailing.

Light stimulates the interior pituitary through reflex action to produce growth hormone which is necessary for growth and early maturation. Different amounts of daily light with different intensities affects growth rate of birds. It was observed that broilers grown under 24 hours light system gave the poorest results when compared with 12 hours photoperiods i.e. 12 hours continuous light and 12 hours continuous darkness (Savory, 1976).

It was thus planned to initiate an investigation to see the effect of different photoperiods alongwith space densities on the performance of broiler chicks.

## MATERIAL AND METHODS

The experiment was conducted at the Poultry Research Centre, University of Agriculture, Faisalabad. One hundred and eighty (Hubbard) day-old commercial broiler chicks were purchased from the market for this study. The experimental room was divided into 2 blocks. Each block was partitioned into 9 pens of 10 chicks each. One block provided a space density of 1.0 sq. ft. while the other provided 0.8 sq. ft. bird$^{-1}$. Three pens from each block were randomly allotted to one of the following three photoperiods:

1. 24 hours continuous light
2. 20 hours light
3. 16 hours light

The chicks were randomly divided into 18 experimental units of 10 chicks each and then these experimental units were randomly allotted to the rearing pens with two different space densities. Random allotment of 3 photoperiods to each group for space density was done in such a way that 3 experimental units were subjected to one of the photoperiods mentioned above. Other managemental conditions were kept uniform for all birds during the experimental period of 7 weeks.

## RESULTS AND DISCUSSION

**Weight gain:** The mean weight gain chick$^{-1}$ according to space density of 1.0, 0.8 sq. ft. and photoperiods of 24, 20 and 16 hours is given in Table 1. The maximum weight gain was recorded with 1.0 sq. ft. space density. A definite relationship was found between space density and weight gain. The results showed that with an increase or decrease of 0.2 sq. ft. density,there was 2.32 and 2.26% increase or decrease, respectively in weight gain.

**Table 1. Average weight gain (g) chick$^{-1}$ from 0-7 weeks of age**

| Space density | Photoperiod (hours) | | | Mean |
|---|---|---|---|---|
| | 24 | 20 | 16 | |
| 1.0 sq. ft. | 1921.23 | 1977.20 | 1949.65 | 1949.36 a |
| 0.8 sq. ft. | 1883.44 | 1904.23 | 1928.03 | 1905.23 b |
| Mean | 1902.33 b | 1940.71 a | 1938.84 a | |

Commercial broiler starter mash was offered for the first 4 weeks of age and then broiler finisher mash was fed upto 7 weeks of age. Feed was provided *ad libitum* throughout the experiment. Fresh and clean water was also made available at all times. The chicks were vaccinated against Newcastle disease at day-old through intraocular route and intramuscular route at four weeks of age.

The brooding temperature was kept at 35°C during first week and after that the temperature was gradually decreased at the rate of 3°C week$^{-1}$ till four weeks onward and the room temperature was recorded twice daily, morning and evening. The birds were weighed at the start of the experiment and at weekly intervals, thereafter. The weekly record of feed consumption was also maintained to compute feed efficiency.

Minimum weight gain (1902.33 g) was recorded in the group provided 24 hours photoperiod. With a decrease of 4 hours i.e. 20 hours photoperiod, there was an increase of 2.02% in weight gain. With a further decrease of 4 hours (16 hours photoperiod), there was an increase of 1.92% when compared with 24 hours photoperiod. These results revealed a significant difference between space densities ($P<0.01$) and among different photoperiods ($P<0.05$) (Table 2).

The interaction between both the traits was non-significant. These results indicated that increase in space density significantly increased weight gain. When DMR test was applied for paired comparison among different photoperiod groups, the results revealed that there was no difference between 20 or 16 hour photoperiods but both these periods were significantly better than

**Table 2. Analysis of variance of weight gain, feed consumption and feed efficiency**

| Source of variance | Mean squares | | |
|---|---|---|---|
| | Weight gain | Feed consumption | Feed efficiency |
| Space density (S) | 8762.22** | 287820.40** | 0.03** |
| Photoperiods (P) | 2809.15* | 18058.15* | $0.002^{NS}$ |
| S x P | 1033.98 | $11499.16^{NS}$ | $0.001^{NS}$ |
| Error | 473.61 | 3765.20 | 0.002 |

24 hour photoperiod. These results are in line with those of Rushaj (1987) and Donkoh *et al.* (1989). They observed that lighting regimes and increasing space densities had significant influence on weight gain of broiler chicks.

**Feed consumption:** The mean feed consumption under space densities of 1.0 and 0.8 sq. ft. bird$^{-1}$ and under three photoperiods of 24, 20 and 16 hours is given in Table 3.

in photoperiod tended to increase feed consumption by 2.72%. Further reduction of 4 hours in photoperiod, caused further increase in feed consumption (0.91%) when compared with 24 hours photoperiod group. When compared with 20 hours photoperiod group, 1.79% reduction was observed. It is evident from the results that continuous light or long hours of reduction in photoperiod lead to reduction in feed consumption.

**Table 3. Average feed consumption (g) chick$^{-1}$**

| Space density | Photoperiod (hours) | | | Mean |
|---|---|---|---|---|
| | 24 | 20 | 16 | |
| 1.0 sq. ft. | 4065.50 | 4250.50 | 4104.45 | 4140.15 a |
| 0.8 sq. ft. | 3866.00 | 3896.55 | 3899.19 | 3887.24 b |
| Mean | 3965.75 b | 4073.52 a | 4001.82 b | |

Better feed consumption chick$^{-1}$ was observed under 1.0 sq. ft. space density. By decreasing space density by 0.2 sq. ft. chick$^{-1}$, 6.11% feed consumption was reduced. This indicated that low space density had a depressing effect on feed consumption. When the data were tabulated according to different photoperiods, the minimum feed consumption was observed under photoperiod of 24 hours. Reduction of 4 hours

The space density was found to significantly ($P<0.01$) affect the feed consumption (Table 2). It was also observed that differences in feed consumption recorded in different photoperiod groups were significant ($P<0.05$). These results indicated that birds reared under 1.0 sq. ft. density consumed significantly more feed as compared to chicks reared under 0.8 sq. ft. density. However, the difference in average feed

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**Table 4. Average feed conversion ratio chick$^{-1}$**

| Space density | Photoperiod (hours) | | | Mean |
|---|---|---|---|---|
| | 24 | 20 | 16 | |
| 1.0 sq. ft. | 2.11 | 2.15 | 2.10 | 2.12 a |
| 0.8 sq. ft. | 2.04 | 2.04 | 2.02 | 2.04 b |
| Mean | 2.08 | 2.09 | 2.06 | |

consumption under 20 and 16 hours photoperiod was found to be non-significant. The results are in agreement with the findings of and Donkoh *et al.* (1989) who reported significant effect on feed intake when birds were reared under different space densities and different lighting regimes.

**Feed conversion:** Average feed conversion ratio broiler$^{-1}$ chick upto 7 weeks age reared under different space densities and photoperiods is shown in Table 4.

Better efficiency was observed in low space density i.e. 0.8 sq. ft. and short photoperiod (16 hours). This may be because of the depressing effect of less space density and significantly (P<0.01) affected the feed efficiency. The chicks reared under low space density showed significantly better feed efficiency. The observed mean variation between different photoperiod groups and the interaction between both the variables was non-significant (Table 2). These results are substantiated by the findings of Donkoh *et al.* (1989).

**Mortality:** The total number of chicks died during this study was 14. The mortality percentage was 0.73 and 1.84 in birds reared in space densities of 1.0 and 0.8 sq. ft. bird$^{-1}$ while under three photoperiods (24, 20 and 16 hours) it was 1.10, 1.3 and 1.38, respectively.

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