# Impact of Stocking Density on the Growth Performances of Caged Broilers During Summer Season

# Abstract

The present study investigated the effect of stocking density on the growth performance of caged broilers during the summer season in small animal laboratory, Department of animal husbandry and dairying, Prayagraj Utter Pradesh. A total 72 day-old (Cobb-400) broiler chicks were randomly assigned to different treatment groups, each with eight replicates. Three stocking density treatments viz. T1 (2 sq. ft. per bird,) T2 (1.33 sq. ft. per bird) and T3 (1 sq. ft. per bird) were carried out. The birds in all the treatments and replicates fed with the same uniform standard diet as per BIS 2007. The results showed that birds in the 1.33 sq. ft. per bird group had the highest body weight and gain in weight followed by that of 2 sq. ft. and 1 sq. ft. per bird groups. Higher stocking density led to a decrease in body weight due to increased stress and competition for resources. A moderate stocking density optimized space usage and improved growth performance. While there were no significant differences in gain in weight, the trend favored the moderate density. These findings highlighted the importance of maintaining the suitable stocking density to improve the growth, health, and productivity of broilers, especially in hot conditions.

***Key words:*** *Broiler Chicks, Growth Performance, Stocking Density and Summer Season,*

# Introduction

The poultry industry plays a vital role in meeting the global demand for high-quality protein. Broiler chicken production, in particular has experienced remarkable growth due to its efficiency and the increasing consumer preference for poultry meat. However, maximizing production efficiency while ensuring bird welfare remains a significant challenge. Among the numerous factors affecting broiler production, stocking density has emerged as a critical determinant of growth performance, health and overall welfare of broiler chickens **(Puron *et al.,* 1995** and **Dozier *et al.,* 2005).** The primary objective of poultry producers globally is to optimize the kilograms of chicken produced per unit area while minimizing production losses associated with overcrowding, in order to achieve a favourable economic return. In the current industry standard, stocking density is quantified based on mass per unit of space, rather than the number of birds housed within a given area **(Thaxton *et al*., 2006).**

The performance of poultry meat production is closely associated with the growth rates and carcass characteristics of broiler chickens. Providing optimal environmental conditions and adequate nutrition is essential for the modern commercial broiler strains, which are specifically bred for intensive production systems (**Skomorucha *et al.,* 2009).** Any deviation from optimum conditions will lead to reduced performance in terms of profitability (**Griffin, 1996).** To attain optimal performance in poultry production, effective housing management is crucial. This includes allocating a specific amount of floor space per bird to ensure a comfortable and conducive environment for growth and development.

Stocking density is a critical environmental factor that significantly influences the welfare of broiler chickens. In modern broiler production systems, the stocking density varies according to local regulations, production systems and target body weight. High stocking densities often result in reduced airflow at the bird level, hindering the effective dissipation of body heat into the surrounding air. Additionally, increased stocking density can impair air quality due to insufficient ventilation and elevated ammonia concentrations. Furthermore, it restricts access to feed and water, fostering a competitive environment among the birds. Elevated stocking density is also associated with an increased risk of health issues, including leg abnormalities and heightened susceptibility to diseases (**Bandyopadhyay *et al.,* 2006; Qaid *et al.,* 2016** and **Nawarathne *et al.,* 2020).**

The discrepancies observed across these studies highlight the need for more targeted research to better understand how different stocking density rates influence broiler performance. Regulating the thermal environment of the broiler shed to an optimal level is critical for minimizing thermal stress, thereby ensuring maximum production efficiency. Maintaining a normal body temperature serves as one indicator of achieving this optimal thermal balance **(Bessei, 2006).** The summer season presents unique challenges for broiler production, as high temperatures can exacerbate the negative effects of inappropriate stocking densities. Heat stress during this period can lead to reduced feed intake, slower growth rates and increased mortality rates **(Farooq *et al.,* 2001).** Therefore, understanding the interplay between stocking density and seasonal variations is essential for developing effective management strategies.

This study aims to evaluate the effect of different stocking densities on the growth performance of broiler chicks during the summer season. By identifying optimal stocking densities under high-temperature conditions, this research seeks to provide practical recommendations for enhancing broiler production efficiency while ensuring bird welfare.

# Materials and methods

**Experimental Design and Management**

The experiment was conducted on 72 day-old broiler chicks (Cobb-400) reared in battery cages for five weeks of age. The chicks were randomly distributed into three treatments and the chicks in each treatment were further sub-divided into eight groups to serve as replicates. The chicks were reared in 24 cages of identical dimensions (2 ft x 2 ft), each with an area of 4 square feet with a combination of 2 chicks, 3 chicks and 4 chicks in the cages. Broilers were randomly assigned to three treatments: T1 (2 sq. ft./bird), T2 (1.33 sq. ft./bird), and T3 (1 sq. ft./bird), respectively. The birds in all the treatments and replicates were fed with the same uniform standard diet as per BIS 2007.

**Data collection**

The data were collected on weekly basis, body weight recorded every week whereas gain in weight was calculated by subtracting body weight from previous week’s body weight and data were collected from every replicate of the treatments

**Statistical analysis**

The data were statistically analyzed using Analysis of variance (ANOVA) technique as per **Snedecar and Cochran (2004).**

# Results and Discussion

**Body weight**

The result pertaining to the average body weight of chicks contained in Table 1 revealed that chicks in T2 (943.52 g) had the highest mean body weight followed by T3 (924.97 g) and T1 (870.57 g), respectively. The mean body weight showed significant differences between the values of stocking density treatments. T2 (1.33 sq. ft per birds) had the significant highest body weight as compared to T1 (2 sq ft per birds) and T3 (1 sq. ft. per bird). It was observed that in high stocking density caused significant reduction in body weight of broilers. Similarly, **Doizer *et al.,* (2005)** reported thatbody weight was adversely affected by increasing the placement density from 30 to 45 kg of body weight /m2 in deep litter floor. Also **Mtileni *et al.,* (2007)** reported thatstocking density, time and their interaction significantly (P<0.05) influenced body weight of broiler breeder hens. However, **skrbic *et al.,* (2009)** observed that there was no significant effect of stocking density on the weight of chickens at three weeks of age. However, during the second weighing at six weeks of age, there was a tendency for final body weights to increase as the stocking density decreased. **Meena *et al.,* (2022)** reported thatoverall mean body weight for the whole experimental period was observed significantly (P<0.01) higher in (8 birds /m2) stocking density than control group (10 birds /m2) and lowest gain in (12 birds /m2) density group. Whereas, **Fairchild, (2005); Tong *et al.,* (2012)** and **Silas *et al.,* (2014)** reported that stocking density had no significant effect (P>0.05) on the body weight. Variation in different results of authors’ may be attributed to variation in managemental practices, rearing seasons, type of housing and geographical area.

**Table 1.**  Average body weight of chicks

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatments** |  | **Weekly Body Weight of broilers (g.)** | | | |  |
|  | **Week 1** | **Week 2** | **Week 3** | **Week 4** | **Week 5** | **Mean** |
| **T1** | 149.87 | 405.62 | 827.75 | 1256.5 | 1713.12 | **870.57** |
| **T2** | 158.37 | 443.87 | 893.5 | 1368.75 | 1853.12 | **943.52** |
| **T3** | 158.75 | 454.12 | 883 | 1350.75 | 1778.25 | **924.97** |
| **Mean** | **155.66** | **434.53** | **868.08** | **1325.33** | **1781.49** | -- |
| **Results** | **NS\*\*** | **S\*** | **S\*** | **NS\*\*** | **S\*** | **S\*** |

**\* Significant**

**\*\* Non-significant**

**Gain in weight**

From the perusal of data on average gain in weight of chicks contained in Table 2 revealed that chicks in T2 (365.74 g) had the highest mean gain in weight followed by T3 (347.39 g) and T1 (336.12 g), respectively. Birds in group T2 (1.33 sq. ft. per birds) had the highest gain in weight as compared to T1 (2 sq. ft. per birds) and T3 (1 sq. ft. per bird). However, mean gain in weight showed non-significant differences between the values of stocking density treatments. These results are in agreement with the observations of **Silas *et al.,* (2014)** who reported that stocking density had no significant effect on the gain in weight. **Tong *et al.,* (2012)** reported thatthere was no difference in gain in weight from 29 to 42 d of age. **Bruno *et al.,* (2017)** observed thatthere wasno effect of 10 birds /m2 densities (P>0.05) on gain in weight in the period of 17 days since the birds were smaller at this early phase and had enough space for moving toward feeders and drinking fountains, whereas birds reared at densities of 12 and 14 birds m2 found lower weights, without differing from those housed at a density of 10 birds. Whereas, **Son (2013)** reported thatgain in weight were similar during the first two weeks. However, from 4 to 5 weeks of age, gain in weight was significantly higher in the low density group compared to the high density group (P<0.05). Consequently, gain in weight remained significantly higher in the low-density group than in the high-density group (P<0.05) over the total experimental period.

**Table 2.**  Average gain in weight of chicks

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Treatments** | **Weekly Gain in Weight of broilers (g.)** | | | | |  |
|  | **Week 1** | **Week 2** | **Week 3** | **Week 4** | **Week 5** | **Mean** |
| **T1** | 108.62 | 257 | 422.125 | 428.75 | 464.12 | **336.12** |
| **T2** | 116.12 | 285.25 | 467.75 | 474 | 485.62 | **365.74** |
| **T3** | 117.62 | 295.375 | 428.75 | 467.75 | 427.5 | **347.39** |
| **Mean** | **114.12** | **279.2** | **439.54** | **456.83** | **459.08** |  |
| **Results** | **NS\*\*** | **S\*** | **S\*** | **NS\*\*** | **NS\*\*** | **NS\*\*** |

**\* Significant**

**\*\* Non-significant**

# Conclusion

The findings of the present study revealed that stocking density significantly affect the growth performance of caged broilers during the summer season. Birds reared at 1.33 sq. ft. per bird showed highest body weight and gain in weight as compared to at 2 sq. ft. and 1 sq. ft. per bird. Higher stocking density reduced body weight due to stress and competition for space and resources. Moderate stocking density optimized resource utilization, promoting better growth performance. While non-significant differences were observed between the values of gain in weight of broilers. However, the trend favoured to moderate stocking density. This highlighted the need for proper stocking density to improve bird growth, health, and productivity in hot weather conditions.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

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