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Assessment of electric brooder as a method to control early mortality in poultry

¹Sachin Pant, ³Sanjay Chaudhury and ³Jyoti Kanwal

¹SMS-Veterinary Animal Sciences, KVK, Champawat, Uttarakhand, India

²Professor/Head, KVK, Nainital, Uttarakhand, India

³Young Professional-II, Directorate of Extension Education, GBPUAT, Pantnagar, Uttarakhand, India

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Corresponding Author: Sachin Pant

Abstract

Early chick mortality is still one of the major constraints affecting poultry production, particularly under small-scale and rural farming systems where efficient brooding management is often lacking. The present study was conducted to assess the effectiveness of electric brooders in reducing early chick mortality and improving growth performance under field conditions in Champawat district, Uttarakhand. A total of 375 day-old chicks were randomly allocated into three treatment groups: T₁ (traditional farmer practice using bulb and heater without balanced feeding), T₂ (electric brooder), and T₃ (electric brooder combined with improved housing, litter management, balanced feeding, and feed supplementation). The trial was conducted for 28 days, during which body weight and mortality were recorded on days 3, 7, 14, 21, and 28. Results revealed that birds under T₃ recorded the highest final body weight (878.34 g), followed by T₂ (836.14 g) and T₁ (705.14 g). Mortality was highest in T₁ throughout the trial period, whereas T₃ consistently showed the lowest mortality, reaching zero by day 28. The findings demonstrate that electric brooder technology, particularly when integrated with improved management practices, is an effective and economically viable strategy for reducing early chick mortality and improving poultry productivity in rural production systems.

Keywords: Electric brooder, chick mortality, brooding management, poultry production, growth performance, rural poultry farming.

Introduction

Poultry products, specifically meat and eggs, are a rich source of high-quality proteins, minerals and vitamins, thereby contributing significantly to human nutrition as well as food security (FAO, 2022) ^[1]. In recent decades, poultry farming has emerged as a pivot sector in Indian agricultural economy, primarily driven by the high demand for poultry-derived food products. According to recent estimates, India ranks third-largest producer of eggs and among the leading producers of poultry meat globally. The layer and broiler segments are projected to grow annually at an approximately 6–7% and 8–10%, respectively (DAHD, 2022) ^[2].

Despite being a profitable enterprise poultry farming faces several challenges, particularly during the early stages of chick rearing. Several environmental factors such as temperature, humidity, air quality, ventilation, and lighting critically influence chick survival, growth, and overall performance (Deaton *et al.*, 1996; Malheiros *et al.*, 2000) ^[3]. Newly hatched chicks are poikilothermic and are thus unable to regulate their body temperature independently. To gradually develop thermoregulatory ability and become homeothermic it takes around 4–5 days, a phase which is generally termed as early brooding period (Tzschentke, 2007) ^[5]. Improper brooding management, especially temperature management, can result in high mortality rates reaching up to 25% in ill managed poultry farm (Purswell *et al.*, 2008) ^[6]. Consequently, maintaining optimal

environmental conditions is essential to minimize economic losses and improve productivity.

Efficient brooding management, plays a crucial role in ensuring optimal growth and productivity. Artificial brooding systems are widely employed to provide controlled environmental conditions necessary for chick development (Purswell *et al.*, 2008) ^[6]. Recent advancements in technology, such as temperature sensors, automated ventilation systems, and Internet of Things (IoT)-based monitoring platforms have further enhanced the development of precision poultry farming (Zhang *et al.*, 2020) ^[7]. These technologies enable continuous monitoring and regulation of environmental parameters, thereby enhancing production efficiency and ensuring animal welfare. Such innovations are particularly beneficial for small-scale farmers by reducing operational costs and improving profitability.

In developing countries, poultry farmers often encounter significant constraints in adopting modern brooding systems due to limited access to reliable electricity, high energy costs, and logistical challenges. Conventional brooders powered by electricity, gas, oil, coal, or biomass fuels present limitations related to cost, fuel availability, and temperature regulation. These challenges are particularly pronounced in rural and remote areas (Islam *et al.*, 2014) ^[8]. Therefore, there is a pressing need to develop cost-effective, energy-efficient, and easily manageable brooding systems suitable for resource-limited settings.

In view of these challenges, the present study aims to develop and evaluate an efficient and economically viable brooding system that ensures optimal environmental conditions for chick rearing while minimizing operational constraints.

Materials and Methods

Experimental Site and Study Design

The trial was conducted at farmer field of Champawat district, a total of 375 chicks were procured from private hatchery and randomly allocated into three treatment groups where T₁ comprised of brooding using traditional farmers practice of using bulb and heater without balanced feeding, T₂ composed of brooding using electric brooder while T₃ combined use of electric brooder with improved housing, feeding using litter, balanced feeding along with feed supplementation.

Housing Management

A deep litter housing system was adopted for rearing the chicks, providing one square foot space per chick. The poultry house was thoroughly cleaned, washed with fresh water, and disinfected before the start of the experiment. Recommended temperature and relative humidity were maintained throughout the experimental period and recorded regularly.

Preparation and Management of Brooders

The experiment was conducted in February, 2025. Brooder preparation was completed two days prior to the arrival of chicks. Each replication group was provided with a separate brooder. A chick guard made of plain sheet was used during the initial brooding period and removed after the first week.

General Management Practices

Proper ventilation along with optimum temperature and humidity was maintained inside the poultry house. Temperature and relative humidity were recorded daily using a thermometer. Lighting was provided using 100-watt bulbs fixed at a height of 6–7 feet. In T₃, sawdust was used as litter material. The litter was sun-dried for 6 hours prior to use and screened to remove coarse particles. Litter depth was maintained at 2–3 inches. Regular litter turning was practiced to minimize gas and moisture accumulation. Damp litter was replaced with fresh material during later stages of the experiment.

Feeding and Vaccination

Clean drinking water was made available continuously. Birds were vaccinated against Newcastle Disease (ND) and Infectious Bursal Disease (Gumboro) as per standard vaccination schedule. In T₃, commercial pre-starter feed was procured from the local market and provided ad libitum to birds from 1 to 28 days of age.

Data Collection

The experiment was conducted for a period of four weeks (28 days) during which body weight and mortality were observed on day 3, 7, 14, 21, and 28. The performance parameters namely average live weight and mortality rate in each treatment group were calculated.

Statistical Analysis

The field experiment was conducted using a Randomized Block Design (RBD) with a single factor and five replicates to ensure robust statistical analysis and to minimize errors. Data were analyzed using analysis of variance (ANOVA) and critical differences (CD) at a 5% significance level were calculated to identify statistically significant differences between the treatments. Statistical software STPR and OPSTAT were used for analysis of variance test.

Results and Discussion

The data presented in the Table 1 present a progressive increase in average chick body weight with advancing age across all treatment groups. Significant differences ($P < 0.05$) were observed among treatments at all observation intervals, as indicated by the critical difference (C.D.) values.

Among the treatments, T₃ consistently recorded the highest average chick body weight throughout the trial period, followed by T₂, while T₁ exhibited the lowest body weight gain at all stages of observation. On Day 3, chick weight ranged from 49.45 g in T₁ to 67.96 g in T₃, indicating an early positive effect of the treatment. At the end of the trial period i.e. Day 28, chicks under T₃ attained the maximum body weight (878.34 g), which was substantially higher than T₂ (836.14 g) and T₁ (705.14 g). The higher body weights recorded under T₃ suggest better growth performance, likely due to improved brooding efficiency and more favourable environmental conditions that enhanced feed utilization and reduced stress. Overall, the findings clearly demonstrate that T₃ was the most effective treatment for promoting chick growth during the brooding period, followed by T₂, whereas T₁ was comparatively less efficient.

Table 1: Average body weight in different treatment groups

	Day 3	Day 7	Day 14	Day 21	Day 28
T ₁	49.45	124.78	281.88	432.18	705.14
T ₂	62.08	139.38	322.58	501.18	836.14
T ₃	67.96	157.14	355.22	568.86	878.34
C.D.	3.41	4.81	3.88	4.20	67.03
SE(m)	1.03	1.45	1.17	1.27	20.24
SE(d)	1.46	2.05	1.66	1.80	28.62



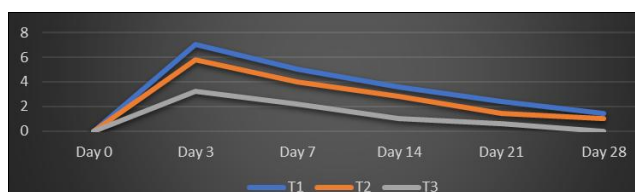
Graph 1: Average Body Weight in different Treatments

Another parameter observed during the trial was chick mortality which was highest during the initial brooding phase i.e. Day 3 and progressively declined with advancing age in all treatment groups. Among the treatments, T₃ consistently recorded the lowest mortality throughout the trial period, followed by T₂, while T₁ exhibited the highest mortality at all observation intervals. On Day 3, average mortality of chicks was significantly higher in T₁ with 7.0 compared to T₂ with 5.8 and T₃ with 3.2. The same pattern

continued on Day 7, where average mortality declined to 5.0, 4.0, and 2.2, respectively. By Day 14, average mortality further decreased, with T₃ showing only 1.0, T₂ with average mortality of 2.8 and T₁ with 3.6 average mortality. At Day 21, T₃ maintained superior performance with 0.6 average mortality, which was substantially lower than T₁ with 2.4 and T₂ with 1.40. Remarkably, by Day 28, zero mortality was observed in T₃, while T₂ and T₁ still recorded 1.0 and 1.4 average mortality, respectively. The details are given in Table-2 and graphically represented below:

Table 2: Average Mortality (No.) in different treatment groups

	Day 3	Day 7	Day 14	Day 21	Day 28
T ₁	7.00	5.00	3.60	2.40	1.40
T ₂	5.80	4.00	2.80	1.40	1.00
T ₃	3.20	2.20	1.00	0.60	0.00
C.D.	0.66	0.72	0.66	0.94	0.47
SE(m)	0.20	0.22	0.20	0.28	0.14
SE(d)	0.28	0.31	0.28	0.40	0.20
C.V.	8.39	12.94	18.13	43.12	39.53



Graph 2: Average Mortality in each Treatment

Recently hatched chicks possess an immature thermoregulatory system and are unable to regulate body temperature efficiently during the first few weeks of life, making external heat supplementation essential for maintaining physiological homeostasis (Pal *et al.* 2025) ^[9]. Yerpes *et al.* (2020) ^[10] reported that first-week mortality is an important welfare and production indicator and is significantly influenced by environmental and management-related factors during brooding. Electric brooders provide continuous, uniform, and controllable heat distribution compared to traditional brooding methods such as charcoal stoves, kerosene lamps, hay-box brooders, or natural brooding systems. Renwick and Washburn (1982) ^[11] demonstrated that brooding chicks under lower temperatures significantly increased mortality and feed conversion ratio while reducing weight gain and physiological adaptation. Similarly, Van de Ven *et al.* (2009) ^[12] observed that improper brooding temperatures and delayed access to favourable environmental conditions adversely affected early chick performance and survivability.

Proper brooding temperature ensures better yolk sac absorption, improved metabolic adaptation, and enhanced immune competence in young chicks (Yerpes *et al.*, 2020) ^[10]. The lower mortality observed in the present investigation may thus be associated with improved physiological adaptation and better early growth performance under electric brooder management. Dougherty and Moses (1933) ^[13] reported that inadequate ventilation in electric brooders increased humidity and moisture accumulation, adversely affecting chick health and growth. Muhammad *et al.* (2010) ^[14] observed that inadequate brooding management, poor sanitation, and environmental stress were among the major factors responsible for early

chick losses in small-scale poultry production systems.

The findings of the present investigation are also in accordance with previous reports suggesting that optimized brooding systems improve early chick welfare, flock uniformity, and production performance. Controlled brooding conditions reduce stress-induced immunosuppression and furthermore, improved chick survivability directly contributes to enhanced economic returns by reducing replacement costs and increasing flock productivity.

Conclusion

The present study demonstrates that brooding management through electric brooders effectively combats early chick mortality by ensuring optimum thermal comfort, maintaining environmental hygiene, minimizing stress, and improving physiological adaptation of chicks during the critical early life period. Adoption of electric brooder technology under rural and commercial poultry production systems may therefore significantly improve chick survivability, production efficiency, and profitability.

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