



ISSN: 2456-2912

VET 2024; 9(3): 434-437

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www.veterinarypaper.com

Received: 20-03-2024

Accepted: 25-04-2024

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Hatchability and egg break-open analysis of backyard poultry (Peruvudai chicken) in various districts of Tamil Nadu in India

G Prabakar, P Ravi, N Karthikeyan, R Dhinesh Kumar, L Arun and P Kumaravel

Abstract

Peruvudai and Siruvudai are the important varieties of indigenous backyard-type chicken reared in Tamil Nadu. A study was performed to assess the hatchability and egg break-open analysis of Peruvudai chicken hatching eggs incubated in a natural brooding system by broody hens. Hatchability and embryonic mortality were recorded. The eggs that failed to hatch were break opened to determine the stage of embryonic mortality. The fertility percentage of the three districts was 90.78, 90.17, and 93.43. The overall mean of hatchability on the total egg set was 74.75%. The breakopen study of unhatched eggs revealed 9.56% early embryonic mortality, 6.32% mid-embryonic mortality, and 2.48% late embryonic mortality, including death in the shell. The total embryonic mortality was 18.36%. Indigenous Peruvudai chickens have good fertility and hatchability levels similar to Indigenous Siruvudai chicken. Natural incubation of Peruvudai chicken's reproductive performance is lower than the artificial incubation.

Keywords: Peruvudai, natural incubation, fertility, hatchability and embryonic mortality

Introduction

The poultry industry plays a vital role in the Indian rural economy in terms of meat and egg supply. Recently, native chickens have become progressively more popular for low investment and resistance to diseases (Arora *et al.*, 2011; Haunshi *et al.*, 2011)^[1, 2]. The Peruvudai chicken is one of the critical Tamil Nadu chicken breeds and is well known for their majestic gait, stamina, pugnacity, and fighting characteristics. Based on the coloring pattern and locality different varieties are identified, reared and marketed accordingly by the local growers. Usually, birds used for game (cock fighting) will fetch higher price and are much in demand. So, rearing these birds will increase the farmer's regular income. Peruvudai chicken has comparatively more body weight and costlier than Siruvudai chicken. It requires only a low initial investment (shed, feed, management practices, and special care), and also, rearing of birds is mainly in an extensive system where the birds find natural feeds (wasted grains, kitchen waste, insects, and termites) through scavenging. As per the 20th livestock census, the total poultry population in India is 851.81 million (DHAD 2019)^[3], with an increase of 16.8% over the previous census (19th census), whereas the total backyard poultry in the country was 317.07 million in 2019, increasing 45.8% over the 19th Livestock census. Indigenous chicken contributes to more than 20% of total egg production in India. One of the most critical positive characteristics of Peruvudai chicken is their hardiness, which is the ability to tolerate harsh environmental conditions (Nwakpu *et al.*, 1999)^[4] and poor husbandry practices without much loss in production. Therefore, more consideration should be given to studying and characterizing the lesser-known and largely deserted breeds like the Peruvudai chicken to plan for conservation and posterity. The knowledge of the performance of a Peruvudai chicken and its various economic traits is essential for formulating breeding plans for further improvement in production traits. Rearing Peruvudai chicken has recently been considered a potential source of standard income among youth entrepreneurs. So, more small-scale farmers are rearing Peruvudai chicken as backyard poultry. However, the characterization of Peruvudai chicken concerning hatchability traits and early embryonic mortality data under field conditions in the

natural incubation by broody mother is generally unavailable. The main objective of the present study is to describe the Peruvudai chicken hatchability performance and embryonic mortality status under field conditions.

Materials and Methods

A study evaluated the hatchability and embryonic mortality pattern in Tamil Nadu indigenous Peruvudai chicken. The study was conducted in three different districts of Tamil Nadu (Tiruppur, Karur, and Dindigul) India. The eggs used for this study were collected from Peruvudai hens reared under a backyard system of management. The base population of these birds were initially collected from local farmers of the breeding tracts in the surrounding area. The sex ratio practiced in the farm was 1:10. The eggs (Karur -154 nos; Thirupur -174 nos and Dindigul-174 nos) were collected and stored at room temperature and set in the natural brooding method by the broody hens. The farmers brooded eggs using traditional bedding materials like sand, paddy straw, etc. The hatched-out chicks were pulled on the 21st day. The unhatched eggs were break-opened to examine the cause for hatching failure. The egg break-open analysis recorded infertile eggs and different embryonic mortality stages (early, mid, and late). Statistical analysis of the data was done by one way ANOVA as per Snedecor and Cochran (1989)^[5].

Results and Discussion

The results of the hatchability of Peruvudai chicken eggs and findings of egg break-open analysis of unhatched eggs are presented in Table 1. A total of 502 native Peruvudai chicken eggs were hatched out under natural incubation from different farmers. Among 502 eggs, 460 eggs were fertile. The fertility value was 91.46% (ranging from 90.17 to 93.43%) which is nearly in agreement with the findings of Vasanthi *et al.* (2022)^[6] where Nicobari black eggs had 87.50-90.73% and Jamima *et al.* (2020)^[7] in Siruvudai (86.59-91.67%) under artificial incubation.

The hatchability percentage of the total egg set was 74.75%. These results are in a close agreement with Getachew *et al.* (2021)^[8], where two strains of Ethiopia native chickens (Abobo and Gambella ketemaZuria) under artificial incubation showed hatchability percentage levels of 82.27% and 76.82% respectively and report of 75 to 83.72% in Siruvudai chicken (Vasanthi *et al.*, 2022)^[6].

In our study, fertile egg set hatchability % varied from 80.81 to 82.14 (mean 81.64%) which was in agreement with the report of 83.12% in natural incubation of Tellicherry chicken of Kerala (Kumar *et al.*, 2013b)^[9] and lower than the reports of Siruvudai chicken value of 95.28% in artificially incubation (Jamima *et al.*, 2020)^[7].

The data on embryonic mortality is shown in Table and figure 1. The early embryonic mortality rate was (9.56%), mid (6.32%), and late (2.48%) embryonic mortality. There was no significant difference between the districts in early, mid, late and total embryonic mortalities under field conditions (under natural incubation). In this study, a higher incidence of mortality was observed in the early stage of life followed by the mid and late or dead in shell. In our result (Early embryonic mortality) was in agreement with the finding of Kumar *et al.* (2013a)^[10] and Vasanthi *et al.* (2022)^[6]. They reported that more embryonic mortality was observed in early life. Early embryonic mortality was related to the age of the egg and the sperm as well as to the conditions the egg conservation before incubation, prolonged storage of the egg, position of egg (small end up), high humidity and temperature

in earlier phase of incubation, nutritional deficiency and contamination of bacteria. The mid embryonic mortality rate of 6.32% was observed in our study. This result was in disagreement with the finding of 0.60% by Vasanthi *et al.* 2022^[6]. Mid embryonic mortality is mostly related to nutritional deficiencies in breeder, abnormality of embryos and improper sanitary hygiene (Kumar *et al.*, 2013a)^[10]. The finding of late embryonic mortality was 2.48%. This result was closer to the report of 2.34% by Vasanthi *et al.*, 2022^[6], and higher than the report of 0.96% by Kumar *et al.*, (2013b)^[9]. Late embryonic mortality is associated to the inappropriate conditions of incubation (Elibol *et al.*, 2006; 2008),^[11, 12] deficiency of nutrients, contamination by bacteria, malformations, failure to pipping of egg, physiological and genetic causes (Kumar *et al.* 2013a)^[10].

There was no significant difference in total embryonic mortality between the three districts, where in the values of Karur, Thirupur and Dindigul were 17.86%, 18.03%, 19.19% respectively.



Fig 1: Infertile



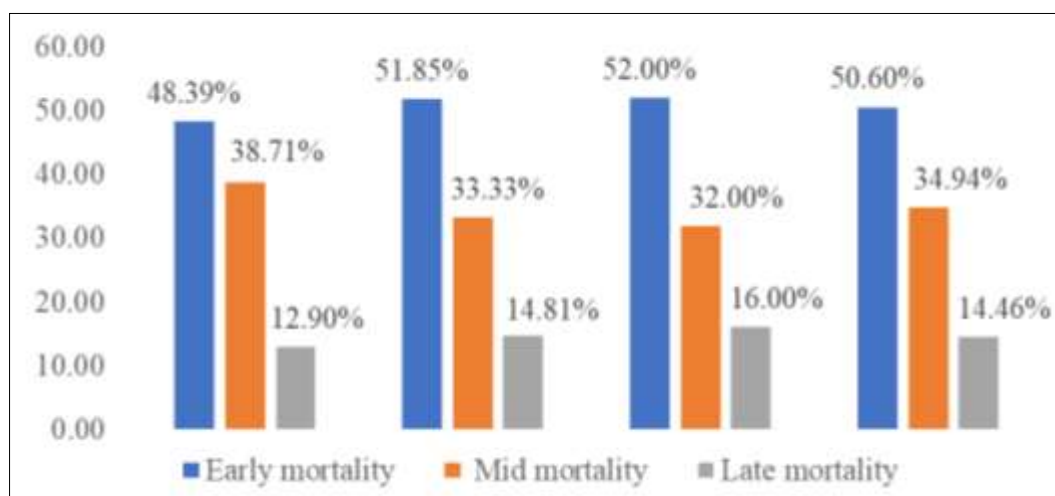
Fig 2: Early stage



Fig 3: Mid-stage

Table 1: Fertility, hatchability, and egg break-open analysis of Indigenous Peruvudai chicken under natural incubation in field condition

District	Total egg	Fertility %	Hatchability% Total egg set	Hatchability% Fertile egg set	Embryonic mortality %			
					Early (%)	Mid	Late	Total
Karur	154	90.78±1.66	74.75±2.89	82.14±2.32	9.61±2.03	5.69±1.51	2.56±1.16	17.86±2.32
Tirupur	174	90.17±1.67	74.13±3.76	81.97±3.43	9.48±1.83	5.84±1.71	2.70±1.21	18.03±3.43
Dindigul	174	93.43±2.05	75.38±2.10	80.81±1.71	9.58±0.84	7.43±1.05	2.18±0.97	19.19±1.71
Mean		91.46±1.04	74.75±1.69	81.64±1.46	9.56±0.93	6.32±0.82	2.48±0.63	18.36±1.46
F value		0.925	0.044	0.078	0.002	0.004	0.059	0.078

**Fig 4:** Embryonic mortality pattern of indigenous Peruvudai chicken under natural incubation in field condition

Conclusion

It is concluded that indigenous Peruvudai chickens have good fertility and hatchability levels similar to indigenous Siruvudai chickens. Natural incubation of Peruvudai chicken's reproductive performance is lower than the artificial incubator which may be due to the improper incubation condition by broody hens. Farmers lack proper knowledge on some of the constraints related to indigenous chicken reproduction, such as broody hen's performance, improper hatching egg storage, egg selection, candling, optimal sex ratio, seasonal variation, nutritional deficiency, and bacterial contamination which are the major factors in determining the embryonic mortality and reduced hatchability.

Acknowledgement

Not available.

Author's Contribution

Not available.

Conflict of Interest

Not available.

Financial Support

Not available.

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How to Cite This Article

Prabakar G, Ravi P, Karthikeyan N, Dhinesh Kumar R, Arun L, Kumaravel P, *et al.* Hatchability and egg break-open analysis of backyard poultry (Peruvidai chicken) in various districts of Tamil Nadu in India. International Journal of Veterinary Sciences and Animal Husbandry. 2024;9(3):434-437.

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