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Comparing live shrinkage loss in male and female commercial broiler chicken during transport

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Abstract

The Indian poultry sector has experienced substantial growth in both chicken meat and egg production. According to the (FAO 2024), India's poultry meat production in 2024 was around five million metric tonnes. A critical aspect of production, especially in the broiler market, is the transportation of broiler chicken from farms to market and slaughterhouses. Several issues in this process lead to economic losses, particularly due to extended transport times, which result in increased mortality rates and live weight shrinkage. In India, 95% of the broiler chicken market is wet. Once broiler chicken reach market age, they are transferred to chicken traders for marketing. This study aimed to estimate the live shrinkage loss associated with the sex of broiler chickens during transportation from farms to traders. The study was conducted at the Department of Poultry Science, Madras Veterinary College, Chennai, India, using data from a commercial broiler farm and a wholesale chicken trader in Tamil Nadu. Data collected included the live weight of birds, categorized by sex, at both the farm and upon arrival at the trader. After six hours of feed withdrawal, a total of 104 birds (52 males and 52 females) were weighed separately. Crate weights were recorded before and after loading the birds. The birds were transported overnight in trucks over a distance of 40 km, taking 90 minutes to reach the destination. Upon arrival, the weight of each bird was measured, and live shrinkage loss was calculated. The data were analysed using an independent t-test in SPSS software, revealing a significant difference in shrinkage loss between male and female broilers. Female broilers showed higher shrinkage loss (0.1447 ± 0.0013) compared to males (0.1418 ± 0.0), with the difference being statistically significant ($P < 0.05$). The higher shrinkage loss in females can be attributed to several factors. Female broilers generally have more fat and less muscle mass than males, and fat is more susceptible to dehydration and catabolism during stress. Additionally, females have a lower metabolic rate, which may reduce their ability to retain water during stressful conditions like transport. Their smaller size compared to males also makes them more vulnerable to external stressors such as temperature variations or overcrowding in crates. In conclusion, the study found that male broilers experience less live shrinkage loss than females during transport. Since males generally achieve better body weight at market age, rearing male birds exclusively for meat production can have a positive economic impact for farmers by minimizing transport-related shrinkage losses.

Keywords: Live shrinkage loss, male, female commercial broiler chicken, transport

Introduction

The Indian poultry sector has seen significant growth in both chicken meat and egg production. Despite these achievements, several critical challenges remain, including reducing production costs, planning production volumes, managing sectoral growth, and aligning consumption with the preferences of consumers in both national and international markets. The vertical integration system in commercial broiler production facilitates the movement of broilers from rural farmers to urban areas, where the market and processing plants are located. Several factors contribute to production and economic losses in the broiler market. One of the most critical stages in production is the transport of broilers from the farm to the market. Many issues in the production process, particularly during the transport of broilers from poultry farms to slaughterhouses, lead to economic losses for producer companies (Nijdam *et al.*, 2004; Schwartzkopf-Genswein *et al.*, 2012) [2, 3]. Live shrinkage loss, or the reduction in body weight of broiler chickens during transport, is a critical concern in the poultry industry.

This weight loss occurs primarily due to feed and water deprivation, stress, and environmental factors such as temperature fluctuations, stocking density, and transportation duration. Shrinkage loss can directly impact the profitability of poultry production by reducing the final live weight at processing, which in turn affects carcass yield and overall economic returns. Broilers are caught by hand on the farm, loaded into crates, and transported by truck over varying distances. Extended transport durations prior to slaughter negatively affect carcass yield and economic returns due to increased mortality rates and live weight shrinkage (Bianchi *et al.*, 2005) [4].

During transit, the birds are exposed to a range of stressors, including motion, acceleration, vibration, withdrawal of feed and water, noise, restriction of movement, social disruption, and other micro-environmental factors (Kettlewell and Mitchell, 1994) [5]. Major factors affecting mortality rates during transport include ambient temperature and humidity, time of day, density of broilers in cages and trucks, season, distance from the poultry farm to the slaughterhouse, and transportation duration (Vieira *et al.*, 2011) [6]. Additionally, the bird's age, sex, and health status also play a role in production losses. In India, 95% of the broiler chicken market is wet, once broiler chickens reach market age, they are transferred from the farm to a chicken trader for marketing. Gender-based differences in live shrinkage loss have been observed in various studies, with male and female broilers exhibiting distinct physiological and behavioral responses to transport stress. Males, typically larger in size, may experience higher metabolic rates and greater evaporative losses, whereas females, often smaller, may show different levels of resilience to transport conditions. Understanding these variations is crucial for optimizing transportation strategies and minimizing economic losses in commercial poultry production. The aim of this study is to estimate the live shrinkage loss associated with the sex of the bird during transport from the broiler farm to the chicken trader for marketing.

Materials and Methods

A study was conducted at the Department of Poultry Science, Madras Veterinary College, TANUVAS, Chennai, India. Data were collected from a commercial broiler farm and a wholesale chicken trader in Tamil Nadu, India. The data included the live weight of the birds, categorized by sex, at both the commercial broiler farm and upon their arrival at the wholesale chicken trader. After six hours of feed withdrawal, a total of 104 birds, including 52 males and 52 females, were weighed separately. The empty weight of each crate, as well as the weight of each crate after loading the birds, were recorded. The birds were caught and loaded into crates during the night. The crates were then loaded onto trucks specifically designed for poultry transport. They were transported during the night when the temperature was about 20°C. They were transported to a distance of 40 kilometres from the farm and reached their destination in 90 minutes. Upon arrival at the chicken trader, the weight of each bird was measured, categorized by sex, and the live shrinkage loss was calculated using the following formula:

Live Shrinkage Loss (%) = [(Initial Weight of the Bird - Final Weight of the Bird) / Initial Weight of the Bird] × 100

Statistical analysis

The data were analysed using an independent t-test, with statistical analyses conducted using the SPSS software

package.

Results

Table 1: Shrinkage loss of male and female commercial broiler chicken (Mean ± SE)

Parameter	Sex of birds		F value
	Male (n=52)	Female (n=52)	
Shrinkage loss (%)	1.999±0.0	2.089±0.04	16.855*

*Significant ($P<0.05$) ** highly significant, NS-Not Significant. No of observations (n) = 52

A significant difference was observed in shrinkage loss between male and female of commercial broiler chicken. Shrinkage loss was significantly higher ($P<0.05$) in females (2.089±0.04) compared to males (1.999±0.0).

Discussion

The results of this research show that female commercial broiler chickens had a greater live shrinkage loss during transportation than their male counterparts. A number of factors may be responsible for this difference that has been noted, including physiological, metabolic, and behavioural differences between the two sexes. One reason may be that females tend to have a smaller body mass and a larger surface-area-to-body-weight ratio than males. This may contribute to higher evaporative water loss and a greater risk of dehydration during shipping. Females may also have lower fat stores, which could impair their capacity to withstand extended periods of feed and water deprivation, and thus leave them more susceptible to weight loss due to stress. Stress response is also of significant importance in live shrinkage loss. Existing literature indicates that female broilers can have a more intense stress response than males when subjected to environmental stressors like handling, crowding, and temperature fluctuation. Stress levels can cause higher respiratory rates, increased energy expenditure, and excessive fluid loss, all contributing to higher shrinkage loss. Additionally, the fact that female broilers are smaller may predispose them to being compressed and physically stressed during transportation, which can further contribute to their weight loss.

The second is the difference in metabolic rate between males and females. Although males have a larger body size and hence greater absolute metabolic rates, females could have proportionally greater metabolic activity per unit body weight. This may result in more energy loss and fluid loss during transportation, increasing shrinkage loss in women further. The greater shrinkage loss females have important economic and welfare consequences for broiler production. Excessive loss of weight not only lowers the ultimate processing weight but also causes concern over bird welfare. To counteract this problem, transport conditions need to be maximized to reduce stress, water loss, and high metabolic expenditure. Measured approaches like varying the stocking densities by sex, maintaining adequate ventilation, and minimizing transportation time can reduce live shrinkage loss in female broilers. In general, the research emphasizes the necessity of sex-specific transport management practices to minimize weight loss and improve broiler performance. Future studies should aim to further explore the physiological mechanisms underlying gender-based differences in shrinkage loss and identify practical interventions to enhance transportation efficiency and bird welfare.

Conclusion

Based on the findings of the present study, it can be concluded that male broilers exhibit lower live shrinkage loss during transport compared to their female counterparts. Additionally, male broilers attain higher body weights at market age, contributing to improved overall yield. The greater live shrinkage loss observed in females during transport could negatively impact economic returns. Therefore, unless specific transport and handling strategies are implemented to mitigate these losses in females, rearing both sexes together may prove economically inefficient. Consequently, rearing male broilers alone for meat production appears to be a more profitable strategy for poultry farmers.

Conflict of interest

The Authors declare that there is no conflict of interest.

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