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Influence of turning duration during incubation on slaughter characteristics of broiler chickens

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Abstract

An experiment was conducted using 840 fresh eggs from commercial broiler breeders to evaluate the influence of turning durations during incubation on slaughter characteristics of broiler chickens. Total eggs were divided into seven treatment groups and eggs were turned once in one hour from day one to 18.5 days (444 hours) of incubation (T₁-Control), 17.5 days of incubation (T₂), 16.5 days of incubation (T₃), 15.5 days of incubation (T₄), 14.5 days of incubation (T₅), 13.5 days of incubation (T₆) and 12.5 days of incubation (T₇). Thirty chicks hatched from each treatment group were randomly selected, sexed and divided into three replicates with ten chicks per replicate. All the birds were reared in open-sided deep litter system with standard and uniform feeding and management conditions for 35 days. At the end of trial, six birds from each treatment were slaughtered to assess the slaughter characteristics (per cent of pre-slaughter live weight) of the trial birds. The result revealed that the New York dressing yield showed no significant variation among treatments. Dressing yield differed significantly ($p < 0.05$), with the highest value in T₆ and the lowest in T₁. Gible, heart, gizzard and small intestine yields showed no significant differences. Liver and abdominal fat percentages varied significantly ($p < 0.05$) with T₇ showing the highest liver weight and T₄ the lowest, while abdominal fat was highest in T₁ and T₇ and lowest in T₄. The findings indicate that turning duration of hatching eggs subsequently influenced dressing yield, liver weight and abdominal fat, while other carcass traits remained similar across all the treatments.

Keywords: Egg turning duration, broiler chickens, slaughter characteristics, dressed weight

1. Introduction

The Indian poultry industry is one of the fastest-growing livestock sectors, producing nearly 4.995 million tonnes of broiler meat annually, per capita availability (7.39 kg) remains below the ICMR recommendation of 11 kg (Basic Animal Husbandry Statistics, 2023) [2]. Hatchery management plays a crucial role in determining the quality and performance of broilers raised for slaughter. Turning of hatching eggs during incubation remains essential for supporting normal embryonic development. Egg turning provides multiple benefits, including minimizing embryo malpositioning (Robertson, 1961) [7] and preventing abnormal adhesion of the embryo to the shell membrane (New, 1957) [5]. These effects are associated with improved embryonic development, such as protein accumulation in the amniotic fluid, growth of the area vasculosa, enhanced gas exchange (Deeming, 1989, Pearson *et al.*, 1996; Tona *et al.*, 2003) [3, 6, 9] and modulation of thyroid hormone levels (Tona *et al.*, 2003) [9]. Variations in turning duration can improve the chick quality, early growth potential, and subsequent carcass characteristics. Slaughter characteristics such as dressing percentage, organ weights, and abdominal fat deposition are directly influenced by embryonic developmental conditions, positioning incubation practices as key determinants of final carcass quality. While extensive research exists on turning frequency and angle, limited information is available on how the duration of turning affects slaughter characteristics of broilers. Understanding these effects is vital for optimizing hatchery protocols, improving carcass yield, and enhancing overall economic returns. This study focuses on examining how different turning durations during incubation influence slaughter performance in broiler chickens.

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2. Materials and Methods

A total of 840 eggs laid by commercial broiler breeder hens at the age of 33.5th week were received to study the effect of hatching-eggs turning duration on hatchery performances. The fresh hatching eggs received from the breeder farm were stored in egg storage room for 3 days at a temperature of 18 °C with relative humidity of 75 percent. Total 840 eggs were randomly divided into seven treatment groups of 120 eggs per treatment with three replicates per treatment (40 eggs per replicate). The treatment eggs were incubated in forced-draft type incubator and the group of eggs were turned once in one hour from day one to 18.5 days (444 hours) of incubation (T₁-Control), 17.5 days of incubation (T₂), 16.5 days of

incubation (T₃), 15.5 days of incubation (T₄), 14.5 days of incubation (T₅), 13.5 days of incubation (T₆) and 12.5 days of incubation (T₇) in setter compartment.

A total of 30 chicks (15 male and 15 female chicks) from each treatment group were randomly selected, divided into three replicates with five males and five females per replicate (totally 210 chicks for seven treatments), weighed, wing-banded, and placed in their respective treatment partitions for assessing slaughter characteristics. The detail of experiment is presented in Table 1. All the birds were reared in open-sided deep litter system with standard and uniform feeding and management conditions for 35 days.

Table 1: Experimental design of growth study

S. No.	Treatment Groups	Treatment particulars	No of hatching eggs per treatment	No of chicks per treatment
1	T ₁ (Control)	Eggs turned during incubation from 0 hour to 18.5 days	120	30
2	T ₂	Eggs turned during incubation from 0 hour to 17.5 days	120	30
3	T ₃	Eggs turned during incubation from 0 hour to 16.5 days	120	30
4	T ₄	Eggs turned during incubation from 0 hour to 15.5 days	120	30
5	T ₅	Eggs turned during incubation from 0 hour to 14.5 days	120	30
6	T ₆	Eggs turned during incubation from 0 hour to 13.5 days	120	30
7	T ₇	Eggs turned during incubation from 0 hour to 12.5 days	120	30

At the end of the experiment (35th day), one male and one female bird per replicate, totally six birds per treatment group were randomly selected. The birds were slaughtered as per the method of Arumugam and Panda (1970). The New York dressing weight, dressing percentage, weight of gizzard (without inner membrane), liver (without gall bladder), heart (without pericardium), small intestine, abdominal fat. The formulae for calculation of New York dressing percent, dressing yield (per cent), organs yield (per cent) are presented below:

A) New York dressing percentage

$$\text{New York dressing (\%)} = \frac{\text{New York dressed weight (g)}^*}{\text{Pre slaughter live weight (g)}} \times 100$$

Where, *New York dressed weight is live weight - blood and feather weight

B) Dressing percentage

$$\text{Dressing (\%)} = \frac{\text{Dressed weight (g)}^*}{\text{Pre slaughter live weight (g)}} \times 100$$

Where, *dressed weight = New York dressed weight - weight of viscera, head, legs, others offal's and giblet.

C) Organs weight

$$\text{Organ yield (\%)} = \frac{\text{Weight of the organ}^* \text{ (g)}}{\text{Pre slaughter live weight (g)}} \times 100$$

Where, *Gizzard, liver, heart, small intestine, abdominal fat

3. Results and Discussion

3.1 Slaughter characteristics

The influence of turning duration during incubation on slaughter characteristics of broiler chickens is presented in Table 2, The result showed that New York dressing yield (%) did not differ significantly among the treatment groups, ranging from 92.11% (T₃) to 92.64% (T₂ and T₇). T₆ showed a significantly higher ($p < 0.05$) dressed weight percentage (73.76%) compared to all other treatment groups, while T₁ (70.70%) recorded the lowest dressed weight. The giblet, heart, gizzard and small intestine weights (%) showed no significant differences among treatment groups. T₆ (8.26%) recorded a slightly higher giblet yield while T₂ (4.91%) had the lowest. Heart weight ranged from 0.54% (T₃) to 0.61% (T₄) and small intestine weight varied from 5.99% (T₄) to 6.91% (T₁), indicating uniform organ development across treatments. A significant difference ($p < 0.05$) was observed for both liver weight and abdominal fat weight among treatments. The highest liver weight (%) was recorded in T₇ (2.51%), followed by T₂ (2.25%) and T₃ (2.22%), while the lowest weight observed in T₄ (2.07%) and T₆ (2.08%). Similarly, abdominal fat percentage differed significantly ($p < 0.05$), with T₁ and T₇ (1.13%) showing the highest and T₄ (0.74%) the lowest.

Overall, birds in T₆ exhibited slightly better carcass yield performance, while those in T₄ showed leaner carcasses with lower abdominal fat deposition and smaller intestinal weights. The literature concerning the influence of turning duration during incubation on New York dressing yield, dressed weight, giblet weight, heart weight, liver weight, gizzard weight, abdominal fat percentage and small intestine weight of broilers was not traceable.

Table 2: Mean ($\pm$ S.E.) slaughter characteristics (percentage of pre-slaughter live weight) of broiler chicken as influenced by turning duration

Treatment	New York dressing percentage	Dressed yield (%)	Heart (%)	Liver (%)	Gizzard (%)	Giblet (%)	Small Intestine (%)	Abdominal Fat (%)
T ₁	92.62 $\pm$ 0.37	70.70 ^b $\pm$ 0.53	0.60 $\pm$ 0.03	2.11 ^b $\pm$ 0.04	2.21 $\pm$ 0.16	4.92 $\pm$ 0.14	6.91 $\pm$ 0.39	1.13 ^b $\pm$ 0.07
T ₂	92.64 $\pm$ 0.30	70.76 ^b $\pm$ 0.70	0.60 $\pm$ 0.03	2.25 ^{ab} $\pm$ 0.12	2.08 $\pm$ 0.90	4.91 $\pm$ 0.11	6.70 $\pm$ 0.21	0.94 ^{ab} $\pm$ 0.05
T ₃	92.11 $\pm$ 0.30	72.53 ^{ab} $\pm$ 0.43	0.54 $\pm$ 0.02	2.22 ^b $\pm$ 0.14	2.19 $\pm$ 0.16	4.95 $\pm$ 0.26	6.30 $\pm$ 0.18	1.06 ^{ab} $\pm$ 0.07
T ₄	92.23 $\pm$ 0.17	72.20 ^{ab} $\pm$ 0.60	0.61 $\pm$ 0.04	2.07 ^b $\pm$ 0.06	2.35 $\pm$ 0.16	5.04 $\pm$ 0.16	5.99 $\pm$ 0.15	0.74 ^a $\pm$ 0.06
T ₅	92.30 $\pm$ 0.20	72.40 ^{ab} $\pm$ 0.51	0.57 $\pm$ 0.03	2.21 ^b $\pm$ 0.09	2.41 $\pm$ 0.10	5.20 $\pm$ 0.11	6.47 $\pm$ 0.20	0.83 ^{ab} $\pm$ 0.13
T ₆	92.57 $\pm$ 0.52	73.76 ^a $\pm$ 0.85	0.60 $\pm$ 0.03	2.08 ^b $\pm$ 0.05	2.34 $\pm$ 0.14	4.93 $\pm$ 0.10	6.02 $\pm$ 0.20	1.03 ^{ab} $\pm$ 0.14
T ₇	92.64 $\pm$ 0.17	72.01 ^{ab} $\pm$ 0.45	0.60 $\pm$ 0.03	2.51 ^a $\pm$ 0.10	2.31 $\pm$ 0.09	5.39 $\pm$ 0.08	6.78 $\pm$ 0.37	1.13 ^b $\pm$ 0.12
Significance	NS	*	NS	*	NS	NS	NS	*
F-Value	0.50	3.14	0.45	2.50	0.71	0.94	1.95	2.18

Value in each cell is the mean of 6 observations

Mean within a column bearing different superscripts differ significantly

NS-Non significant, *Significant ($p < 0.05$)

4. Conclusion

This study concluded that T₆ exhibited highest dressed weight percentage and overall superior carcass performance. New York dressing yield (%) remained similar across treatments, indicating consistent processing efficiency. Liver and abdominal fat percentages showed variation, with T₇ exhibiting the highest liver weight and T₁ and T₇ showing higher abdominal fat deposition. However, the Eggs turned during incubation from 0 hour to 13.5 days (T₆) emerged as the best treatment, effectively enhancing dressed yield and maintaining desirable carcass traits without adversely affecting other slaughter parameters.

Conflict of Interest

Not available

Financial Support

Not available

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