

Short Communication



Effect of Pre-Warming on Broiler Breeder Eggs Hatchability and Post-Hatch Performance

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Abstract | Hatchability and early chick mortality are regarded as the parameters of assessment of a hatchery. The hatchery's key aim is to provide an even and uniform start of growth for all embryos placed in incubator. The pre-warming process directly influences embryo capability and avoid condensation. In current study, three experimental groups each consist of 4, 03,920 eggs were pre-heated at 82°F for 5 hours (Group A), 82°F for 3 hours (Group B) or without pre-heat treatment (control, Group C) were selected to investigate the effect of pre-warming on hatchability and post-hatch performance. Each treatment group consists of fifteen hatch records of commercial hatchery. Results showed that significant differences ($P < 0.01$) were documented in hatchability percentage between A and C groups (1.339 ± 0.066) as compared to A and B (0.621 ± 0.059), or B and C groups (0.71 ± 0.072). Mortality was reduced significantly ($P < 0.05$) in A (3.18 ± 0.77) and B (3.97 ± 0.63) groups as compared to control (5.39 ± 0.02). Weight gain was increased ($P < 0.01$) in A (1955.66 ± 21.82) and B (1896 ± 83.97) groups than control group (1668.33 ± 32.14). Feed conversion ratio were found significantly better ($P < 0.002$) in A (1.49 ± 0.06) and B (1.72 ± 0.02) groups than C group (1.91 ± 0.05). However, feed intake was not affected ($P > 0.05$) by the pre-warming regimen of eggs. These results suggested that pre-warming of eggs is a beneficial regimen, which may be used to enhance the hatchability and post-hatch performance of broilers.

Keywords | Pre-Warming, Hatchability, Performance, Broiler Chicks

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Poultry is the 2nd largest industry of Pakistan whose play a dynamic role in the GDP of country. Poultry products are rich source of protein and good source of income. Importance of poultry is further emphasized by its demand and production ability in the country (Hussain et al., 2015; FAO, 2011). In Pakistan, currently there are more than twenty-five thousand poultry farms and four hundred hatcheries, that providing employment and income for livelihood of thousands of people and also fulfilling the most of animal protein requirement of the nation. Moreover, the poultry industry has engaged a thousands of veterinarians for disease management and quality insurance of poultry products (Anonyms, 2011; Nazia et al., 2015).

Temperature is the main factors known to influence embryonic development (Mahmud et al., 2011). The effect of pre-heating on hatchability has been evaluated to a partial

developmental stage of embryo before or after pre-heating treatment (Reijrink et al., 2009). It is of interest to point out that, prior storage, heating the chick eggs for six hours allowed the complete formation of hypoblast (Silva et al., 2008). The effects of pre incubation on hatchability are directly depending upon their flock management, nutrition, age and pre-heating temperature/period. It was documented that the chick weight, hatchability and temperature are very closely interrelated (King'ori, 2011). Development of embryo in broiler breeder eggs are started from the time of laying, as at the moment of lay, the egg temperature is above 40°C (North and Bell, 1990). In the recent decades, several studies reported that pre-heating of poultry eggs before storage resulted in more live chicks and a lower level of embryonic mortality compared to the eggs that remained un-heated (Reijrink et al., 2009). Temperature is the mainly critical aspect in hatching egg manage-

ment as temperature affects embryo growth. Pre-warming of hatching eggs enhanced to incubation through prevention of condensation and reduction of variation in egg shell temperatures (Koka, 2002). The pre-warming process straightly influence embryo capability, as it might affect cell death especially when cell viability is reduced after prolonged storage (Koka, 2002). The purpose of this study was to investigate the effect of pre-warming regimen on broiler eggs hatchability and post-hatch performance of chicks.

MATERIAL AND METHODS

SELECTION OF SITE

The current study was performed at Sadiq Poultry (Pvt) Limited, Chakri Hatchery Rawalpindi, Pakistan, one of the largest commercial broiler hatchery of Asia.

EGGS SELECTION AND CLASSIFICATION

Eggs (wt. 53-60 g) from broiler breeders (Ross 308, 45-50 weeks of age) were classified into three groups, such as A, B and C. Group C was served as control, while rest of two groups were treated with different duration of pre-warming in commercial single stage setters (Avida G4, Chick Master USA). Hatchable eggs were selected on the basis of shell quality, weight and color. Only oval shape good quality intact eggs were selected for hatching. The substandard eggs such as cracked, misshapen, blood-stained, dirty, toe-punched and elongated were rejected (Khan et al., 2016). These eggs were collected at farm and stored at 20°C and 75% relative humidity until used in hatching trail. Before, trail eggs were fumigated with 20 g KMnO₄ and 40 ml formalin (40%), and 40 ml of water for 100 ft³ area for 15 minutes.

PRE-WARMING REGIMEN

Each experimental group was consisting of 4,03,920 eggs. Group C (Setter) was served as control group, while group B was pre-heated at 82 °F for 3 hours and group A pre-heated at 82 °F for 5 hours inside incubators. After completion of pre-heating stage the incubator started automatically stage profile (Ross prime age recommended by Chicks Master, USA).

After completing 456 hours (19 days) in incubator the fertility of eggs was checked through candling process. All the infertile eggs were removed from the tray and just fertile eggs shifted to hatcher for next 50 hours (2 days and 8 hours). Hatch pulling was performed after 506 hours. Upon hatching of all chicks, hatchability percentage was calculated.

POULTRY HOUSE CONDITIONS

The chicks from six hatches were delivered to poultry houses through environmentally controlled vehicles (24°C temperature and 65% humidity). At farm, chicks of all three groups were offered water and feed *ad libitum*. Continuous

light was supplied during the whole experimental period. The chicks were fed with starter diets from 1 to 10 d (3010 Kcal ME/kg, 22% crude protein), grower diets from 11 to 20 d (3175 Kcal ME/kg, 20% crude protein) and finisher diets from 21 to 35 d of age (3227 Kcal ME/kg, 18% crude protein). The diet was formulated according to the recommendations of the NRC (1994) using WUFFDA formulation software program. Intake of feed and water was taken daily, while body weight and total feed consumed was recorded on weekly basis. Poultry house conditions were same for all experimental groups and were given in Table 1. For ventilation Viper Touch (Big Dutchman, Co., Germany) system was installed.

Table 1: Environmental conditions of poultry house

Parameters	Week				
	1 st	2 nd	3 rd	4 th	5 th
Temperature (°C)	34-30	30-28	28-25	25-24	24
Humidity (%)	65	65	65	65	65
Ventilation (m ³ /hour/bird)	0.07	0.25	0.40	0.59	0.87

STATISTICAL ANALYSES

All data were analyzed by using Statistical Analysis System package software (SAS version 9.2, SAS Institute Inc., Cary, NC, USA). All means were compared using Duncan's Multiple Range test and results were presented as mean ± SEM (standard error of mean). Results were considered significant if exist P < 0.05.

RESULT AND DISCUSSION

After fifteen successful hatches out for individual group, hatchabilities were recorded. Difference in term of hatchability percentage was found for groups A, B and C which was pre-heated for 5 hours, 3 hours and control, respectively. Group A showed better hatchability percentage and the average of fifteen hatches was recorded 87.31% as compared to B (86.68%) and control (85.96%) group (Figure 1A).



Figure 1: Effect of pre-warming on hatchability. **A)** Hatchability (%) of individual groups; **B)** Hatchability differences between various groups. A, pre-heated at 82°F for 5 hours; B, pre-heated at 82°F for 3 hours; C, without pre-heat treatment (control)

Similarly, difference between groups A and B, B and C and A and C were recorded and shown in Figure 1B. Sig-

nificant difference ($P < 0.01$) were found between A and C groups (1.339 ± 0.066) as compared to A and B (0.621 ± 0.059) or B and C (0.71 ± 0.072) groups.

During 35 d trail period, mortality, feed intake, weight gain and FCR was recorded and results were presented in Table 2. Interestingly, the effect of pre-warming on broilers performance was also found better as compared to control group. Mortality was reduced significantly ($P < 0.05$) in A (3.18 ± 0.77) and B (3.97 ± 0.63) groups as compared to control (5.39 ± 0.02) group. Weight gain (g/bird) was increased ($P < 0.01$) in A (1955.66 ± 21.82) and B (1896 ± 83.97) groups as compared to control group (1668.33 ± 32.14). Feed conversion ratio (FCR) was found significantly better ($P < 0.002$) in A (1.49 ± 0.06) and B (1.72 ± 0.02) groups than C group (1.91 ± 0.05). However, feed intake (g/bird) was not affected ($P > 0.05$) by the pre-warming regimen of eggs.

Table 2: Post-hatch performance of broilers

Parameters	Groups		
	A	B	C
Mortality	3.18 ± 0.77^a	3.97 ± 0.63^a	5.39 ± 0.02^b
FCR	1.49 ± 0.06^a	1.72 ± 0.02^b	1.91 ± 0.05^c
Weight gain (g/bird)	1955.66 ± 21.82^a	1896 ± 83.97^a	1668.33 ± 32.14^b
Feed intake (g/bird)	3048.43 ± 155.84	3179.14 ± 141.60	3068.87 ± 3.51

^{a, b, c}, Denotes significant difference in rows ($P < 0.05$). **A:** Pre-heated at 82°F for 5 hours; **B:** Pre-heated at 82°F for 3 hours; **C:** Without pre-heat treatment (control); **FCR:** Feed conversion ratio

To achieve better hatchability uniform shell temperature is necessary (Renema et al., 2006). Pre-heating is a good tool to avoid condensation that results the improved hatchability (Marandure et al., 2012). Hatchability and hatch window are critical factors to assess the performance of hatchery. Pre-heating provides uniform temperature for growing embryos result more chicks in short hatch window helps to achieve good quality chicks (Tona et al., 2003). Uniform temperature for developing embryos enhances the performance of chicks at farm resulting better FCR and less mortality (Fasenko and O’Dea, 2009).

In summary, the findings of current study tended to show that pre-warming to broiler breeder eggs at 82°F for 5 hours enhances the hatchability. Better performance in terms of weight gain and mortality was found for group A and B, while FCR was highest for A than B group, whereas it was poor for control group. Feed intake was same for all groups.

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AUTHORS’ CONTRIBUTION

Dr. Adnan Yousaf and Dr. Adnan Jabbar are main authors have equally contribution in this work, while Dr. Yasir Allah Ditta help in analysis data statistically.

CONFLICT OF INTERESTS

The authors declare that they have no conflict of interest with respect to the research, authorship, and/or publications of this article.

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