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Effect of Pre-Heating and Turning during storage period on Hatchability and Post Hatch Performance of Broilers

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Abstract

This study was conducted on 320 fertile eggs (52-55 gm of weight) of 34 weeks old breeding flock. These eggs were cleaned, fumigated and stored for 06 days at temperature of 16℃ and humidity 70-75%. Eggs were equally divided into four groups i.e. A, B, C, and D having 80 eggs in each group. The group A was considered as controlled. The eggs of groups B and D were pre heated before setting in incubator while Turning was carried out on the eggs of groups C and D. After incubation (21 days) the hatchability percentages of all the groups were 76%, 77%, 80%, and 82.5% for the groups A, B, C and D respectively. Turning and pre-heating of hatching eggs during holding period did not influence the hatchability percentages significantly (P>0.05). Turning during holding period was responsible for the significant differences (P>0.05) in day old chick weight, weight gain in first week of age and early mortality percentages (during incubation) and had no effects (P>0.05) on F. C. R during first and second week of age. Pre heating of hatching eggs before incubation had no effect (P>0.05) on day old chick weight, weight gain in first and second week of age, F. C. R in first and second week of age and early mortality percentages.

Keywords: Turning, preheating, storage period, hatchability, incubation, post hatch performance.

Introduction

Poultry industry of Pakistan is dynamic for having multidimensional potentials. The different phases, from rearing of grandparents stock till the broilers and eggs are marketed, have their own significance[1]. The importance of chicken is further emphasized by its production ability and the increasing demand of its products. Some constraints and limitation, for instance, the quality of day old chicks; price hike in feed and various management procedures accompany these favorable aspects of poultry production. So far as the future potential of chick is concerned[2]. Between production of the eggs and setting, a certain amount of mortality occurs in the eggs. As a result of this mortality, some embryos are not able to complete the piping process in time and about 10% of the fertile eggs do not hatch[3]. The operation and management of hatchery is vital towards the development of quality day old chicks. Various breeding practices and handling of eggs from egg laying to hatching of egg have an influence on the hatchability, particularly pre-incubation storage condition temperature, along with the age of breeding flock have been the most common variable used to manipulate the fertility, hatchability, livability and consequently effect on the quality of day old chick [4].The fate of broiler chick largely depends upon the quality of hatching eggs, which are collected at breeding farm, stored for sometimes there, or directly transferred to the hatchery. Here these are stored for certain limit of time under specific temperature. The duration of storage needs different temperature. This transitional stay of eggs before incubation is known as "holding period". This stage is very critical for hatchability. The main objective of holding period is to maintain the fertility of hatching eggs for certain period of time. Prior to placing eggs in the incubator, they may be removed from the egg storage room and warmed to room temperature for approximately 6 hour.

Various pre-incubation and storage practices for hatching eggs have considerable influence on the hatching results, chick quality and their performance afterwards. The storage periods of different days could influence the incubation characters of guinea fowl[5]. The present study was therefore conducted to observe the effects of storage conditions under specific temperature and humidity, and pre-warming of hatching eggs before setting in incubator on the hatchability results and broiler performance for early days.

Material and Methods

The experiment was conducted on 320 fertile eggs (52 grams to 55 grams weight) of 34 weeks old breeding flock. These were checked for any breakage or abnormality and very small and

very large eggs were rejected. Only the normal eggs were selected for experimental purpose. The temperature of the environment ranged from 30°C - 40°C with 42-45% relative humidity at that time[6].

Fumigation: After collection the eggs were fumigated with formaldehyde gas using 20 gms $KMnO_4$ and 40cc 40% formaline/100 cubic feet area. The eggs were placed in a room that was airtight. The $KMnO_4$ was placed in a container and 40% formalin solution was added into it. The formaldehyde gas was produced during this process and the room was closed. After some time when the eggs were fumigated these were stored for 6 days at temperature of 16˚C.

Experimental groups: The collected eggs were randomly divided in to 4 groups of 80 eggs each. These groups were designated as A, B, C and D. These eggs were stored in trays specially designed for this purpose. The storage was maintained at 16°C with a relative humidity of 75% throughout the storage periods of 06 days. The eggs of groups A and B were not turned while groups C and D were turned for 6-8 times / day during storage at an angle of 45º on either side[6].

The eggs of groups C and A were not pre heated before incubation while the eggs of groups B and D were pre heated till 85ºF before setting into the incubator for 06 to 07 hours.

Setting of eggs in incubator: The eggs were set in the incubator after the storage period. The temperature of the incubator was maintained at 99.5 °F with 60% relative humidity during the first 19 days. After the 19 days of incubation eggs were transferred from setter to Hatcher. The Hatcher temperature was kept 98.2^{O} F with relative humidity of 70% on day 21. The hatching was completed and the chicks were taken out of the incubator. Then the chicks were counted and divided into their specific groups separated by experimental treatment.

The parameters studied at this stage were; i. Total hatchability percentage. ii. Clean eggs percentages per groups. iii. Early chick mortality per groups. iv. Sticky chicks per group. v. Hatchability percentage per group. vi. Day old chick weight per group.

Day old chick management: When the chicks were divided into their prescribed groups, they were brought to the poultry experimental farm at University of Veterinary and Animal Sciences Lahore for brooding. Initially they were flushed with saturated solution of sugar and were kept under the brooder at the temperature of 95°F. They were given ration no. 4 for the first two weeks. The feed and water supply was ad-libitum. The room temperature and humidity inside the house was maintained at normal for the two weeks. At the end of each week, the required data was collected as; i. Average weight of the chicks per group; ii. Total feed consumed per week per group; iii. Mortality in each group per week; iv. FCR of each group per week.

These parameters were recorded at the end of each week for the period of two weeks

Statistical Analysis: The data obtained from the experiment was subjected to two-way or 2x2 factorial[7].

Results and Discussion

Hatchability: After the incubation the hatchability results were calculated for all the four groups. These were as followed: i. group- A 76 %, group-B 77%, group-C 80%, group-D 82.5%. The overall hatchability of the experiment was 79.0 %.

When these hatchability results were subjected to 2x2 factorial analyses[7], there was no significant difference $_{(P>0.05)}$ for hatchability, -as the total sum of squares became zero. It means that apparently the hatchability results are different from each other, but turning and pre heating during holding period have no pronounced effects on them. Although the hatchability of the group D which was given turning and pre heating during storage is highest than the other three groups.

Day old chick's weight: At the end of incubation the chicks were weighed at first day of their age (as in table 2). All the data was subjected to the 2x2 factorial analyses[7]. Where the pre-heating gave the non-significant results. It means that preheating has no effect $_{(P>0.05)}$ on the day old chick's weight. The turning and Preheating interaction has also not effects on the day old chicks weights $_{(P>0.05)}$. Turning had a significant effect on old chicks weight $_{(P>0.05).}$ When LSD was applied on these results the group D was significantly different from group A, B and C.

Total feed consumed: 1st week of age: During the 1st week of age the same quantity of feed was offered to each group. The detail is given in table 3.

2nd week of age: After second week of age, feed consumption was noted (as noted in table 4). The group D had the maximum feed consumption after second week of age.

Weight gain in 1st Weak of Age: At the end of incubation ten observations were taken from all the four groups after 1st week of days. Then these were subjected to 2x2 factorial analysis[7]. It means the turning has a prominent effect $_{(P>0.05)}$ on the weight gain in 1st week of age. When the results were subjected to LSD test, the group D was significantly different from group A. This shows that group D was given turning during holding period has greater average weight at 1st week of age than the group A. It was then subjected to LSD test. Group D was significantly different than group C.

Weight gain in Second Week of Age: At the end of second week of age ten numeral values were taken from each group i.e. A, B, C and D. The whole data was subjected to 2x2 factorial analysis[7]. It showed that there were no effects of turning and preheating $_{(P>0.05)}$ in holding period on the F. C. R during second week of age.

Feed conversion ratio in 1st week of age: The F.C.R (feed conversion ratio) at 1st week of age was calculated from the data. 10 numerical values were taken from each group. Statistically the data was subjected to 2x2 factorial[7]. The data analysis showed there was no significant differences in the data $_{(P>0.05).}$ It means at 1st week of age the F. C. R was not affected by the turning, pre-heating treatments to the hatching eggs during holding periods

Feed conversion ratio in second week of age: During experiment ten numerical values of F. C. R at the end of second week of age were taken. These were analyzed by 2 x 2 factorials analysis[7]. The F. C. R of the all groups at the end of second week of age was not affected by turning and pre-heating during holding period to the hatching eggs $_{(P>0.05).}$

Mortality percentages: The mortality of the chicks was calculated from the 1st day of incubation till 7th day of age (early mortality). During incubation the mortality results were; group-A 13(79), group-B 10(79), group-C 06(79), group-D 05(80). At the end of 1st week of age the mortality within the groups was; group-A Nil, group-B 2, group-C Nil, group-D 1.

The Total mortality percentages in each group (from 1st day of incubation till the 7th day of each) were; group-A 16.4%, group-B 15.1%, group-C 7.5%, group-D 7.5%.

The mortality percentage was higher in group A and B and less in group D (that was given turning and pre-heating during holding period).

The data revealed significantly higher hatchability $_{(P>0.05)}$ in the group D where the eggs were given both turning for six to eight times per day during holding period and pre-heating for six to seven hours for 85°F before setting into incubator, when compare with all other groups A, B and C. The hatchability percentages increased in the order; group D > group C > group A and group B. Although highly significant differences were seen in between the groups but when the whole data subjected to the statistical analysis, these differences were non-significant nature. The results from this experiment are in agreement with those observed by Abdou[8], who collected 2400 eggs in June-September from indigenous fowl in Tanzania and stored for 0-15 days at room temperature before incubation. Fertility was >71.0% for eggs collected in the different months. Hatchability of fertile eggs stored for 0 days averaged 92.8%. Hatchability percentage was negatively correlated (-0.98) with pre-incubation storage period; it declined by an average of 5.3% for each day of storage. Body weight from 0 to 1 week of age was lower for chicks from eggs stored for longer periods than for those from eggs stored for shorter periods.

Bakst and Gupta reported that fresh laid eggs were stored at 15˚C for 3, 7 or 14 days group (1) or held initially at room temperature (21˚C) for 6-9 hrs. And subsequently stored at 15 ˚C for 3, 7 and 15 days (group 2). Most embryos developing from eggs in both groups progressed to the stage 8 of development, just prior to onset of flock ages. The detrimental effects of storage time on viability in older flocks were attributed to an increased incidence of culls and embryonic losses at all stages[9].

In contrast to the above findings we observed that there is highest hatchability when the eggs were turned and pre-heated during holding period but it is shown by the experiment that when the eggs are from a younger breeder flock (32 week of age), turning of eggs during holding period can slightly improve the hatchability. Pre-heating of the eggs before incubation has no prominent role to improve the hatchability results.

Brand collected batches of 25-55 ostrich eggs from a breeding flock at the Klein Kato Agricultural Development Center in South Africa. Eggs were heated or not heated at 36°C for 4 h, stored for <6 days at 17°C and were then heated or not heated for 16 h at 25°C before setting. Eggs were incubated at 36°C and a relative humidity of 28%. Pre-heating before storage resulted in a greater percentage of live chicks and a lower percentage of embryonic deaths (P<0.05) compared with eggs that were not heated. Heating eggs before setting had no effect in embryo survival[10].

The results for day old chick weight and weight gain at 1st week of age show that there was significantly highest day old chick weight in group D that was given both the turning and pre-heating before incubation. Significantly lowest day old chick weight was reported in group A that was not given both the treatments (control group). The order of increasing average day old chick weight is as follow: group D > group C > group B > group A. From these results it can be stated that the turning of the hatching eggs during holding period contributed more to improve the day old chick weight because it prevented the developing embryos to stick with the eggshells. By this the developing embryos were centralized within the egg shells and nourished at the maximum rate. Also the embryonic membranes prevented them from the traumas of the environment. Due to these reasons the day old chicks were healthier and heavier than those received to turning. The pre-heating before incubation is another factor to contribute in the day old chick weight. This was due to the reason that pre-heating might prevent the

embryos from temperature shock when they were set in the incubator from storage temperature. For weight gain in 1st week of age there was highly significant weight gain in group D that was given turning and pre-heating before incubation. The significantly lowest value for weight gain in 1st week of age was in group A that was not given turning and pre-heating. The decreasing order of weight gain in 1st week of age is group D > group B > group C > group A. When the data was statistically analyzed there was a significant difference for weight gain for all the groups under the factors turning and turning – pre-heating interaction. These results are in agreement for pre-heating factor and in contrast for turning factor with those observed by Asi Jamal, who conducted hatching experiments with 8100 eggs in 4 experiments[11]. Eggs were heated at 38.06°C for 3-18 h during the period before incubating. Best results were found when the total treatment period was less than 12 h during a storage period of more than 14 days. It is concluded that as a result of heating during storage better hatchability and better quality of chicks was achieved.

The results related to the weight gain in 2nd week of age showed that all the groups were significantly not different to each other regarding the two factors turning and pre-heating ($P<0.05$). However, there was significantly highest value for group D, which was given both the treatments, with respect to weight gain in 2nd week of age. The significantly lowest value was per group B that was only given pre-heating before incubation. So the pre-heating and turning do not affect the growth rate of the birds at 2nd week of age. Results regarding the mortality percentages there was higher early mortalities in the groups that had not received turning during holding period i.e. Group A (10.17%) group B (6.77%). In the other groups receiving turning during holding period the early mortalities (during incubation) were quite less than the other contemporaries i.e. group A and group C. There was lowest early mortality in the group D that was provided with the both turning and pre-heating (1.67%). There was no contribution of pre-heating to reduce the early mortalities. Our results are in agreement with Sachdev. He took eggs daily from an unspecified number of Japanese quails, aged 20-24 weeks, and were stored for up to 9 days at 12°C-24°C and a R. H. of 45-58%. Egg fertility ranged from 72.57% for eggs weighing 7.01-8.9 g to 3.24% for eggs weighing 10.01-11.0 g, and hatchability ranged from 74.08% for egg weighing 10.01-11.0 g to 84.28% for eggs weighing 11.01-12.0 g. The percentage of chicks dead in shell was lowest in eggs- weighing 7.01-8.0 g (5.27%), and highest in those weighing 9.01.0 g (13.04%). All these differences were non-significant. Length of storage had no significant effect on egg fertility (70.70-84.12%), hatchability (66.76-85.) or percentage of chicks dead in shell (2.18-16.78), but egg weight loss increased significantly with increasing length of storage, from 0.51% for eggs stored for 1 day to 3.15% for eggs stored for 9 days[12].

Conclusion

At the end of the experiments it is concluded that the turning and pre-heating of hatching eggs during holding period do not influence the hatchability percentages significantly although all the groups with or without these two treatments have different percentages of hatchability. Turning to the hatching eggs during holding period are responsible for the significant difference in day old chick weight, weight gain in during 1st week of age and early mortality percentages (mortalities during incubation). There was no effect of turning on F. C. R during 1st and 2nd week of age. Pre-heating of hatching eggs before setting into incubator has no influence on day old chick weight, weight gain in 1st and 2nd week of age, F. C. R in 1st and 2nd week of the age and early mortality percentages.

It means the turning of hatching eggs six to eight times per day during holding period of five to six days is desirable to get the more number of healthier and heavier day old chicks. Pre-heating of hatching eggs however prevents the temperature shock to the developing embryos in the eggs but can not increase the number of heavier and healthier day old chicks at the end of incubation.

References

1. Khan M.J., Effect of storage, preheating, and turning during storage on Hatchability, *1st Edition. VDM Verlag Dr. Muller GmbH and Co. Germany* **(2011)**

2. Khan M.J., Important Diseases of domestic birds, *1st Edition, LAP LAMBERT Academic Publishing GmbH and Co. Germany* **(2011)**

3. Meijerhof M., Theoretical and empirical studies on temperature and moisture loss of hatching eggs during the preincubation period, *Dissertation **1774** Wageningen Agriculture University , Netherland (***1994)**

4. Koka T.D., Effect of storage and pre heating during storage on hatchability, *Poultry Science,* **12(8),** 21-23 **(2002)**

5. Brah G.S and J.S. Sandhu, Pre-incubation storage effects on guinea fowl eggs at tropical temperatures, *Tropica Agriculture, Trinidad,* **61(1),** 35-36 **(1984)**

6. Mahmud A. and Pasha T.N., Effect of storage, preheating and turning during holding period on the hatchability of broiler breeder eggs, *Pakistan Vet. Jour.,* **28(3),** 153-154 **(2008)**

7. Steel R.G.D and Torrie J.M., Principles and Procedures of statistics, 2nd ed. McGraw Hills Book Co. Inc. New York, **(1980)**

8. Abdou F.H., Effects of the preincubation storage periods of hatching eggs on the hatchability and post-hatching

growth of local chickens under tropical conditions. *Beitrage zur Tropischen Landwirtschaft and Veterinarmedizin,* **28(3),** 337-342 **(1990)**

9. Bakst M.R. and Gupta S.K., Pre-incubation storage of turkey eggs. Impact on rate of early embryonic development, *British Poul. Sci,* **38(4),** 374-377 **(1997)**

10. Brand Z., The effect of pre heating of ostrich eggs prior to storage and setting in commercial hatcheries, North Korian agricultural development center, South Africa **(1998)**

11. Asi J., Effects of periodical heating on hatchability of hen during different storage periods, *Baromfitenyeszies es feldolgozas,* **39(1),** 3-10 **(1992)**

12. Sachdev A.K., Effects of egg weight and duration of storage on the weight loss, fertility and hatchability traits in Japanese quail, *Indian Journ. Poul Sci.,* **20(1),** 19-22 **(1985)**

Table-1
Hatchability percentage

Groups	No. of egg set	No. of clear eggs	Early chick mortality	No. of sticky chicks	No. of chicks hatched	Hatchability percentages
A: Preheating -ve Turning –ve	**79**	**06**	**07**	**06**	**60**	**76**
B: Preheating +ve Turning –ve	**79**	**08**	**06**	**04**	**61**	**77**
C: Preheating –ve Turning +ve	**79**	**08**	**04**	**02**	**63**	**80**
D: Preheating +ve Turning +ve	**80**	**09**	**05**	**--**	**66**	**82.5**
Total	**317**	**31**	**22**	**12**	**251**	**79.0**

Table-2
Day old chick weight

Serial no.	Group	Day old chick weight
01	Group A	41.49gms
02	Group B	41.59gms
03	Group C	42.02gms
04	Group D	43.27gms

Table-3
Feed consumed in first week of age

Groups	Total feed offered	Feed refused	Feed consumed
A	200 grams	80 grams	130 grams
B	200 grams	90 grams	120 grams
C	200 grams	90 grams	125 grams
D	200 grams	70 grams	110 grams

Table-4
Feed consumed in second week of age

Groups	Feed offered	Feed refused	Feed consumed
A	600 grams	210 grams	390 grams
B	600 grams	220 grams	380 grams
C	600 grams	220 grams	380 grams
D	600 grams	235 grams	365 grams

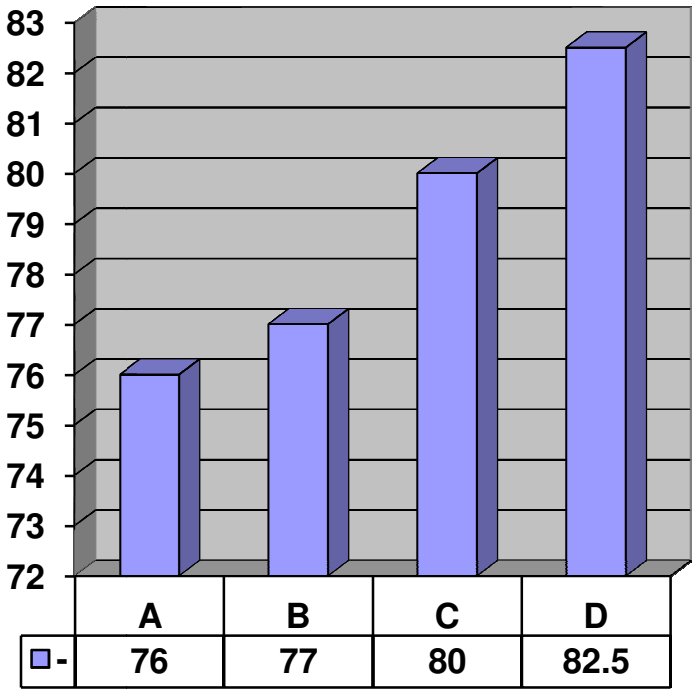

Figure-1
Hatchability percentages

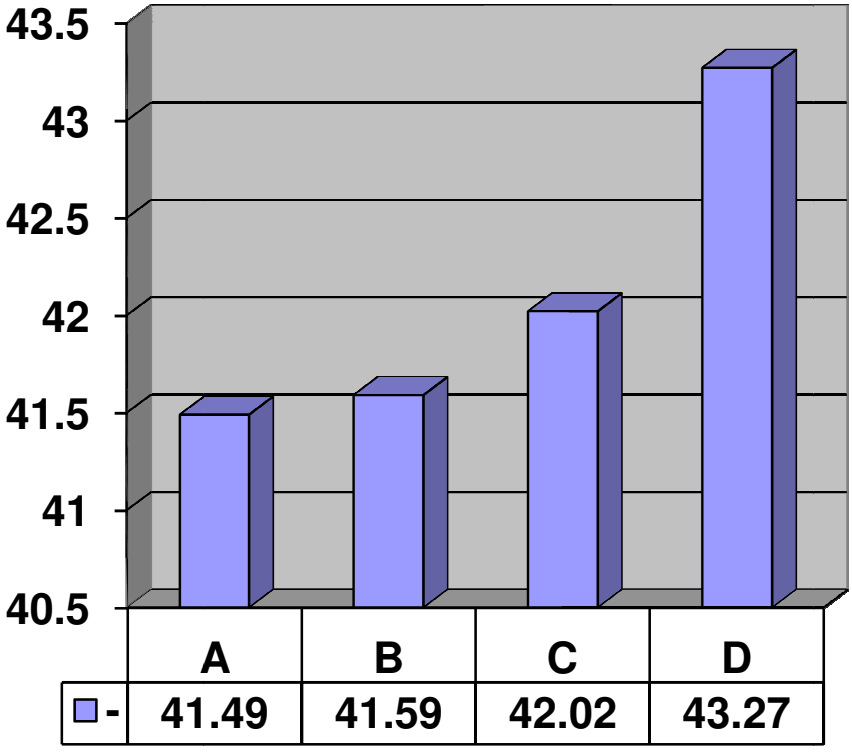

Figure-2
Average day old chick weight