The Study of Pre-warming on Local Breeder Eggs' Hatchability and Post Hatch Performance in a Hatchery at Surkhet.

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Abstract

The hatchery's key aim is to provide an even and uniform start of growth for all embryos placed in incubator. This study is about local breeder which is done in two part. The first experimental part is done to check hatchability of 300 eggs are equally divided into three groups, group A, group B, and group C which are kept at different temperature 99^0F, 100^0F and 101^0F respectively. Group B at 100^0F temperature has better performance. The second experimental part is done to compare the weight gain of chickens which are chosen from first study's group A, group B, and group C. During four weeks, the average weight gain of chicken from group B is more than other two groups. In all three groups, i.e. group A, group B, and group C, p value is less than 0.05. This showed that there are significant effect of by temperature on the hatchability and post hatch performance i.e., weight gain of chickens. These results suggested that which temperature is better for hatchability and post hatch performance. This may be used to enhance the hatchability and post- hatch performance of local breeder.

Introduction

Poultry hatcheries produce a majority of the birds consumed in the development bird including chicken, turkeys, ducks, geese and some other minor birds' species. A few poultry hatcheries specialize in producing birds for sale to background poultry keepers, hobby farmers and people who are interested in competing with their birds at poultry shows. These hatcheries produce chicks of several different breeds and varieties, often including some heritages or endangered breeds (Yousaf & Ditta, 2007).

Larger poultry hatcheries are related to industrials poultry meat or egg production. This is a multi-billion -dollar industry with a highly regimented production system used to maximize bird size or egg production vs feed consumed. Generally, a large number of produced at one time so the resulting birds are uniform in size and can be harvested (for meat) or bought into production (for eggs) at the same time (Gompo, Pokhrel, BR, & Bhatta, 2019).

Poultry generally starts with naturally (most species) or artificially (turkeys and Cornish- related chicken breeds) inseminated hens that lay eggs; the eggs are cleaned and shells are checked for soundness before, being put into the incubator. Incubators control temperature and turn of eggs until just they hatch. Three days before the eggs are scheduled to hatch, they are moved into a hatcher, unit, where they are no longer turned so that embryos have time to get properly oriented for their exit from the shell and the temperature and humidity are optimum for hatching once the eggs hatch and the chicks are a few days old. They are often vaccinated.

Poultry products are rich in protein and income (Hussain, Rabbani, Aslam, & Ahmad, 2015). The poultry industry has engaged thousands of veterinarians for disease management and quality insurance

of poultry products. Quality of eggs hatching and incubation conditions influence local hatch quality. The temperature and humidity play a key role which is essential factors during incubation (Lourens, Van den Brand, Meijerhof, & Kemp, 2005). During the third week of incubation, eggs shell temperature increases due to higher heat production of the embryos both fertility and hatchability of chicken had decreased with the age of the breeders (Ori, 2011). Different temperatures and humidity degrees are required for the embryos at different stages of ages (Kuttappan, Brewer, Apple, & Waldroup, 2012). Modern chickens are extra sensitive to a metabolic disorder such as ascites stages as a result of their genetic selection for quick growth and high meat yield which results in decreased visceral organ development (Khan, Ali, & Mughal, 2016). Temperature is the main factors known to influence embryonic development (Reijrink, Meijerh, Kemp, Graat, & Van den Brand). The effect of pre-heating on hatchability has been evaluated to a partial develop/mental stage of embryo before or after pre-heating treatment (Mahmud & Javed, 2011).

Being agriculture is the main profession of Nepali so poultry form has the importance in economy. Agriculture contributing almost 43%of National GDP (Gross Domestic product) of which 15% is from livestock sector (Yadav & Yadav, 2014). The contribution of poultry sector alone is 3.5% of TGDP (Nepal S. Y., 2001) (Gautam & Khadka, 2022). In Nepal there are 7,00,07,151 poultry birds out of them 93.29% are Broiler farms, 6.09%-layer farms,0.58 % parents' farms, and 0.045 Giriraja or Kurloiler (Nepal E. O., 2019). Many persons are employed in this sector.

This is the first study in Karnali province. Without using any chemicals, the study provides an organic mean for the better production of local chicks because this study mainly focuses on parameters: temperature and humidity during incubation and hatchery. As several researches are carried out for broiler breed, the study will be a prototype in local region of Karnali province.

Data are analyzed by using python software which adopts its own programing language (Michel & et al., 1999). Here also used Libreoffice calc to analysis data (Mueller, 2020). We will find the corresponding relation between pre-heating and non-heating samples using necessary statistical tools. To compare the results obtained ANOVA test is done. Analysis of variance (ANOVA) is a statistical technique that is used to check if the means of two or more groups are significantly different from each other. ANOVA checks the impact of one or more factors by comparing the means of different samples. Post hoc tests are an integral part of ANOVA. Post hoc tests are run to confirm where the differences occurred between groups, they should only be run when you have a shown an overall statistically significant difference in group (Brown, 2005).

Method & Methodology

Poultry House Conditions

This research completely organic. The name of the poultry form under this study is incovater hatchery. This poultry form lies at Bheriganga municipality-6, Surkhet. The machine used for hatching is set up by the owner of this poultry form where the main part of the machine was brought. The chicks from three hatches were delivered to poultry. At farm, chicks of all three groups were offered water and feed. light was supplied during the whole experimental period. The chicks were fed with starter diets from.

Eggs Selection and Classification

Egg's weight (45-55 grams) from local breeder was classified into the three groups. They are A, B, & C with different temperature. A, B, & C groups were treated with different duration of pre-warming commercial single stage setters. Hatch able eggs were selected on the basis of shell quality, weight, & color. only oval shape good quality intact eggs were selected of hatching. The substandard eggs such as cracked eggs, misshaped, blood-stained, dirty, toe -punched &elongated were rejected.

Pre-warming Regimen

Each experiment group was consisting of a maximum of 20 eggs. Group A was preheated at 99^0F, while group B was preheated at 100^0F for three hours inside incubators & group A preheated at 101^0F for 5 hours inside incubators. After completion of preheated stages, the incubator started automatically stages profile.

After completion of 506 hours (19 days) in an incubator, the fertility of eggs was served. All the fertile eggs were removed from the tray & just fertile eggs shifted to hatch for the next 48 hours (2 days). Hatch pulling was performed after 506 hours upon hatching of all chick's hatchability percentage was calculated.

Performance measurement

The chicks from different hatches were delivered to the poultry house. At forms, chicks of all three groups were offered water. Continuous light was supplied during the whole experiment period. The chicks were fed. starter died from one to 10 days then grower died from 11 to20 days, & finisher diets from 21 days to 35 days of age. The diets were formulated according to. Intake of feed & ware was taken daily, while bodyweight &total feed consumed as recorded on a weekly basis. The poultry house condition was the same for all experimental groups given in the table below.

Results and Discussions

Temperature is very important factor affecting hatchability and post hatchability performance. This study is divided into two parts one is eggs heating effect and another is the post hatch performance.

Hatchability

The first part of this study is to check the hatchability of different three groups. There are three groups and they are group A, group B and group C. The temperature for group A, Group B, and Group C 101^0F 99^0F, 100^0F and respectively. Total 300 eggs in three groups were selected in this research. Each group consists of 100 eggs. In this section, specially study the hatchability rate of each group and compare them. These three eggs are kept in three different temperatures. The result obtained for these different group is given in table below.

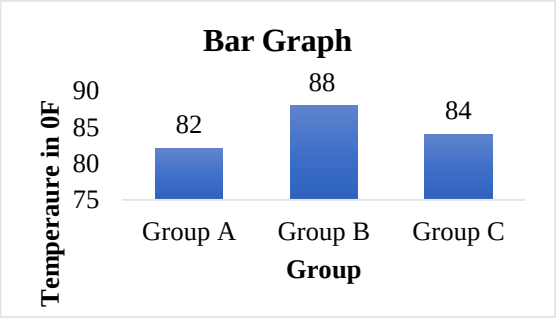

Figure 1. Number of eggs hatched in each group.

From this table, out of 100 eggs hatch able eggs for group A, Group B, Group C are 82, 88, and 84 respectively. From this data, it can be concluded that the hatchability for group B is better than rest of two i.e., temperature 100^0F is better for local breeder eggs' fertile.

Post- hatch performance (weight gain)

To study the post hatch performance i.e., weight gain of chicken, 20 chickens from each group were selected. The weight of selected chickens was similar for each group from the first day. Here, the weight of these chickens up to three weeks are discussed below.

Table 1. Weight of chickens on each week (A1, B1, C1 represents weight of first week of group A, group B, group C respectively, A2, B2, C2 represents weight of second week of group A, group B, group C respectively, A3, B3, C3 represents weight of third week of group A, group B, group C respectively and A4, B4, C4 represents weight of fourth week of group A, group B, group C respectively).

	w1	A1	B1	C1	w2	A2	B2	C2	w3	A3	B3	C3	w4	A4	B4	C4
0	I	80	85	80	II	165	175	160	III	250	260	255	IV	300	310	300
1	I	80	85	80	II	165	175	160	III	250	260	255	IV	300	310	305
2	I	80	85	80	II	165	175	160	III	250	260	255	IV	305	310	305
3	I	80	85	80	II	165	175	165	III	250	260	260	IV	305	310	305
4	I	80	85	80	II	170	175	170	III	250	260	260	IV	305	315	305
5	I	80	85	85	II	170	175	170	III	255	265	260	IV	305	315	310
6	I	80	85	85	II	170	180	170	III	255	265	260	IV	310	315	310
7	I	80	85	85	II	170	180	170	III	255	265	260	IV	310	315	310
8	I	85	85	85	II	170	180	175	III	255	265	260	IV	310	315	310
9	I	85	85	85	II	170	180	175	III	255	270	260	IV	310	315	310
10	I	85	85	85	II	170	180	175	III	260	270	265	IV	310	315	310
11	I	85	85	85	II	170	180	175	III	260	270	265	IV	310	315	310
12	I	85	90	85	II	170	180	175	III	260	270	265	IV	310	320	310
13	I	85	90	85	II	170	180	175	III	260	270	265	IV	310	320	310
14	I	85	90	85	II	175	180	180	III	265	275	265	IV	310	320	310

	w1	A1	B1	C1	w2	A2	B2	C2	w3	A3	B3	C3	w4	A4	B4	C4
15	I	85	90	85	II	175	180	180	III	265	275	265	IV	315	320	315
16	I	85	90	85	II	175	180	180	III	265	275	265	IV	315	320	315
17	I	85	90	85	II	175	180	180	III	265	275	265	IV	315	325	320
18	I	85	90	85	II	175	185	180	III	270	275	270	IV	315	325	320
19	I	85	90	85	II	175	185	180	III	270	275	270	IV	315	325	320

Table 2. Calculation of mean, median, skewness, kurtosis, standard deviation, error for group A, Group B, and Group C in first, second and third week.

	A1	B1	C1	A2	B2	C2	A3	B3	C3
Mean	83.000000	87.000000	83.750000	170.500000	179.000000	172.750000	258.250000	268.000000	262.250000
Mediqan	85.000000	85.000000	85.000000	170.000000	180.000000	175.000000	257.500000	270.000000	262.500000
Skew	-0.442124	0.442124	-1.250514	-0.151554	0.120331	-0.761072	0.289402	-0.159183	-0.084205
Kurtosis	-2.017974	-2.017974	-0.496732	-0.879780	-0.206972	-0.487767	-1.085951	-1.489076	-0.525980
Std	2.5131S23	2.513123	2.221308	3.590924	3.077935	6.972691	6.742442	5.938279	4.435206
Sem	0.561951	0.561951	0.496700	0.802955	0.688247	1.559141	1.507656	1.327840	0.991742

The average weight gains of the 20 chickens for group A at the end of first week were found 83 grams. Similarly, for group B and group C the average weight gain are 87 grams and 83.75 grams respectively. For second week the average weight gain for them were found 170.5 grams, 179 grams and 172.75 grams respectively. At the end of third week the average weight gains of the chickens for group A, group B, and for

group C found to be 258.25 grams, 268 grams, and 262.25 grams. This results shows that during this period the weight gains of 20 chicken for group B is more than group A and group C. Thus average weight gain is better for those eggs which are kept at temperature 100^0F inside incubator. This is also represented in figure 2 below

From this calculation table we see that mean and median are nearly equal and skewness and kurtosis (except in group A and group B kurtosis is less than -2 for first week) are between -2 to +2. Since skew of nearly all data are near to zero and kurtosis is within the range of -2 to 2, we can conclude that data are normal. Also mean and median are nearly equal which also support the idea of normality.

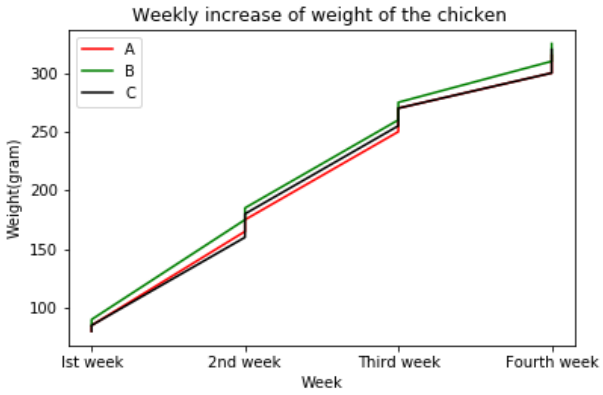

Figure 2. Curve plot of four week's chicken weight.

The curve above shows that the weight gain of the group B is high in all week than that of other two groups. The weight gains of group A and Group C are nearly equal within first and second week but within second- and third-week group C have more weight gain than Group A. The weight gains of group A and Group C with in third and fourth week are overlapping

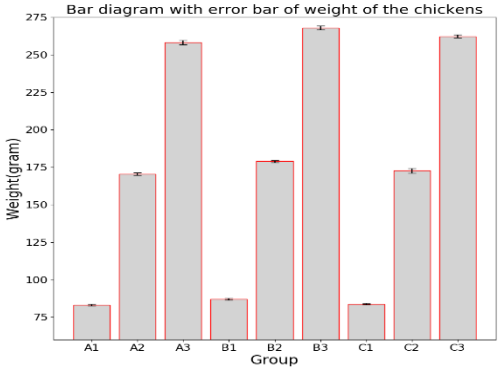

Figure 3. Bar diagram with error bar of weight of the chickens

Error bars are graphical representations of the variability of data and used on graphs to indicate the error or uncertainty in a reported measurement. They give a general idea of how precise a measurement is, or conversely, how far from the reported value the true (error free) value might be. Error bars can be used to compare visually two quantities if various other conditions hold. This can determine whether

differences are statistically significant.

The above bar diagram with error bar shows that variation of three groups' weight gain. There is minimum variation of weight gain of first week whereas the weight gain of third week is maximum.

Table 3. Calculation of p-value.

Source of Variation	SS	Df	MS	F	P-value	F critical
Between Groups	180.8333333	2	90.41666667	15.44194757	4.37541E-06	3.158842719
Within Groups	333.75	57	5.855263158			
Total	Err:508	59				

Since, p value is 4.37541E-06 which is less than 0.05, we can conclude that there is effect of temperature

Table 4. Table for calculation of LSD.

Alpha	Dfw	MS	LSD	3.25
0.05	57	5.85	1.082998784	
2.002465459	2.002465459		1.082998784	4
ANOVA - Single Factor				
Alpha	0.05			
Groups	Count	Sum	Mean	Variance
A	20	1660	83	6.315789474
B	20	1740	87	6.315789474
C	20	1675	83.75	4.934210526

From this calculation in above table shows that the hatching temperature at 100^0F shows the significance difference in weight than other temperature. This is statistically proof by Post hoc test which is shown in above table.

Conclusion

In summary, the study of pre-warming on local breeder eggs' hatchability and post-hatch performance in a hatchery at Surkhet show that there is effect temperature on fertility of eggs and weight gain of chickens from these eggs. Out of 100 eggs similar in weight, color and shape 82, 88 ,84 eggs are hatched at temperature 99^0F, 100^0F, 101^0F respectively. This shows pre-warming to local breeder eggs at 100^0F enhances the better hatchability. Out of 20 chicken from each group having nearly equal weight were chosen from the hatched eggs. The average weight gains of the chicken in group B (first week, second week, and third week are 87 grams, 179 grams and 268 grams respectively) is more than group A (first week, second week, and third week are 83 grams, 170.5 grams and 258.25 grams respectively) and group C (first week, second week, and third week are 83.75 gram, 172.75 gram and 262.25 gram respectively). The average weight of chickens which are heated at temperature 100^0 (group B) in all weeks is more than that of other two temperatures. Thus, 100^0F in better for hatching

purpose in both pre-warming and post hatched performance. The p value is less than 0.05, we can conclude that there is effect of temperature.

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