CHAPTER: 1

INTRODUCTION

Over the past 50 years, global annual meat production has almost quadrupled from 78 million tons in 1963 to 308 million tons in 2015, achieving an impressive growth from about 205 million tons to 319 million tons between 1995 and 2018. During these last two decades, the production of poultry meat increased almost 108% increase (from 54 to 112 million tons), corresponding to a 36% growth of its share in total meat production. Meat production is estimated to double by 2020-2022 due to the growth of the global population and of meat consumption per capita . According to this trend, global consumption of poultry meat is estimated in 128 million tons by 2022 (FAO, 2015).

In Bangladesh the population is also increasing day by day. But the production is not increasing according to our demand. The present meat and egg production can meet only 68 and 64% of the national demand (Hamid *et al.*, 2017). In order to meet this high demand for poultry meat and egg hatcheries need to maximize chick production. Today, hatcheries need to achieve high production efficiency in a sustainable manner, which, in our view, includes maximizing the hatchability of healthy chicks with high survival rates and the maximum expression of their genetic growth potential under any conditions in the field.

But only commercial hatchery cannot able to fulfil our demand as our population is very high. Our 60% people live in rural areas. If we utilize this man power in proper way they can play an important role for national economy. Incubation is the process by which certain oviparous (egg-laying) animals hatch their eggs it also refers to the development of the embryo within the egg under favorable environmental condition. Multiple and various factors are vital to the incubation of various species of animal. In many species of reptile for example, no fixed temperature is necessary, but the actual temperature determines the sex ratio of the offspring. In birds in contrast, the sex of offspring is genetically determined, but in many species a constant and particular temperature is necessary for successful incubation (Van der Pole *et al.,* 2013). Especially in poultry, the act of sitting on eggs to incubate them is called brooding. The action or behavioral tendency to sit on a clutch of eggs is also called broodiness, and most egg-laying breeds of poultry have had this behavior selectively bred out of them to increase production.

The physical factors necessary for successful incubation are temperature, humidity, gaseous environment and turning of eggs. Optimum and uniform temperature inside the incubator is very essential for obtaining satisfactory results. The incubator temperature should be maintained as recommended by the manufacturer. It usually varies from 99.5° to 100.5°F (37.2°C - 37.8°C) for forced draft-type incubators and about 1°F higher for still-air incubators. According to Givisiez *et al*. (2000) an increase of 1ºC (38.8ºC) above the optimum incubation temperature (37.8ºC) starting at day 13 of incubation causes a significant reduction of the hatching rate of broiler eggs, whereas such effect is not observed when the temperature is reduce in 1ºC (36.8ºC). Low temperature slows down the development of embryo and higher than optimum temperature hastens the embryonic development. When abnormal temperature conditions extend over a long period, hatchability is adversely affected by increase in embryonic mortality and weak and deformed chicks.

Humidity in the incubator affects hatchability. Dry and wet bulb thermometers are used for measuring humidity. In fowls egg takes about 21 days to hatch. The relative humidity should be around 60 per cent during the first 18 days of incubation and 70 per cent in the last 3 days for optimum hatchability. In the forced draft-type incubators the temperature requirement decreases as the humidity increases (Tullett *et al.,* 1991).

The eggs are candled from fifth to seventh days of incubation to remove infertile eggs and on 18th day to remove dead germs. Although infertile eggs or eggs with dead germ do not serve any useful purpose, removal of such eggs from the incubator makes the room available for setting of more eggs. In most commercial establishments, candling is done on 17th or 18th day of incubation to save labor. Depending upon the passage of light through the egg, the eggs are classified as infertile when transparent, dead germ when translucent and eggs with live embryos when opaque. Eggs with live embryos only are transferred to the hatcher. For pedigree hatching of eggs they are to be set sire and dam wise in the incubator and also should be placed in the hatcher compartment wise, one compartment for each dam.

In our incubator we maintain temperature humidity by using a controller which is available in the market and its price is also low. Turning is done manually twice a day. Others thing is done according to the principles of incubation.

Objective of study:

1. Preparing low cost incubator.

2. To facilitate hatching in big amount in rural areas.

3. Increase backyard poultry farming

CHAPTER: 2

MATERIALS AND METHODS

2.1 Study area:

The study was conducted in Gafforgoan thana under the district Mymensingh.

2.2 Study period:

The study was conducted during October 2019 to December 2019.

2.3 Materials used for preparing incubator:

In order to make this incubator we use some common materials that can easily collect from the market. Following are the common things that we use for making this incubator

- Plain sheet
- Rod ring
- Net
- A piece of glass
- A piece of hard board
- Herican
- Temperature and humidity regulator machine and HTC meter
- Small fan
- Bulb and electrical board
- Rice husk

2.4 Required measurement of the materials:

- Plain sheet: we need two piece of plain sheet. Both are 20 inch height. One length is 8 feet and another length is 7 feet
- Rod : we use 7 feet length rod to make a circular ring
- Net : we need about 4sq ft net

2.5 Process of preparing low cost incubator:

At first the plain sheet that is 20inch height and 8 feet long the two ending part attach with screw and make it a circular sheet and same way the second sheet that is 20inch height and 7 feet long attach. Then this two sheet place one inside another. Between the two circles there is a gape.

The gap is filled with the rice husk which will act as insulator material. This prevent exchange of heat.

The rods that we take also turn into a circular ring.

Then the circle of rod is covered with the net.

The boundary that is created by the circle of plain sheet is slight larger then the boundary created by the circle of rod ring

The circular rod ring covered by net then place inside the boundary of circular plain sheet.

Then the circuit is connected with the electrical supply. We use two circuit which are automated. One is temperature controller and another is humidity controller.

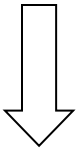
For covering the upper part we use two things one is hard board and another is clear glass. Here we use glass because we can observe the inside condition from outside

We placed a herican inside the middle of the middle of the machine that work when electricity is not available

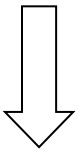
By this way we arrange the all equipment that we need to make this incubator.

2.6 Mechanism of action of prepared incubator:

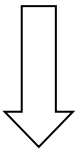
This machine works on 3 basic principles. So used a controller by which we control temperature and humidity.



To control temperature we use a 100 watt bulb. We set a temperature when the temperature cross the limit of set temperature the bulb automatic turn off. To control humidity we use a humiditifier / fog machine. When humidity is low the machine produce fog from water and increase humidity.



The 3rd things that we have to do manually that is turning. We turn the egg twice daily. For this we place a mark in side of the egg. We turn the egg one side to another in the morning and evening



When electricity is not available we turn on the herican to control temperature. To control humidity we spray water manually when humidity is low. If humidity is high then we place some dry material that absorb water like dry paper.

2.7 Cost of manufacturing:

Materials	**Price(tk)**
Plain sheet	1000
Rod	300
Net	100
Rice husk	100
Humidity regulator	600
Fan	50
Controller	1200
Glass and board	600
Bulb	60
Herican	200
Electrical metirials	300
Others	500
Total	**5010**

2.8 Operating cost

Electricity bill per batch(21 days)	300tk
Fuel cost for hericane	200tk
Total	**500tk**

Pictorial presentation of some activities during experiment

Fig 1: making circular ring by bending the rod

Fig 2: placing net upon the circular ring (egg holder)

Fig 3: circle of two plain sheet(body of incubator)

Fig 4: arrangement of full machine

Chapter 3

Result and Discussion

3.1 Hatchability of the prepared incubator:

Batch No	Eggs set	Eggs hatched	Percentage
First	27	23	85%
Second	100	80	80%
Third	150	120	80%

Indigenous chicken eggs were used during the procedure.

So here we can see the three batch history of incubation. After analysis of this data we can decide that average hatching rate of this incubator is about 80%

Incubation is the process of hatching egg artificially where everything is provided artificially that is needed for hatching egg. In rural area people use broody hen for hatching egg. By using broody hen very less amount of eggs can be hatched. So artificial incubator may be the best option in order to incubate egg. Generally, the temperature in maximum incubator maintained between 37 and 39 degrees Celcius. Over heat result in speeding up the development of the embryo that reduce the chance of hatchability and can also result in abnormal chicks. A longer period of low temperatures; however, can result in dead embryos (Byerly, 1998).

In this study humidity level was used 50-55% initially then increased upto 65% this is supported by many other studies (Byerly, 1998; Tullett *et al.*, 1991). Low humidity will cause the eggs to lose too much weight, which means the air space will be larger than what is ideal. A large air space also means the chick will be smaller than normal. Small chicks are weak chicks, and weak chicks cannot always hatch on their own, and they may die just before or just after hatching. A large chick may be a strong chick, but a small air space can affect the respiration and cause problems that way. This also causes a lack of space, making it difficult for the chick to move around and break out of the shell (Walstra et al., 2010). The humidity can be adjusted by increasing or decreasing ventilation in the chicken incubator.

The commercial farms use the incubator that automated. It cost much. It is not possible for rural farmer to buy this type of incubator. So in this regards our incubator may be the best option. If we use this incubator properly people of rural area can play a great rule in the poultry industry. They also meet up their needs of meat and eggs. This incubator runs base on three principles. Among them first of all is temperature. We know that every species has a particular incubation temperature. For chicken throughout the incubation period 37.5 degree centigrade temperature is

used. Temperature management is very easy. If electricity is not available we used hericane to increase temperature. If we need to lowering the temperature we open the upper glass so excess temperature coming out so quickly.

The second one is maintaining the humidity. Humidity varies in the two period. During incubation period from day one to day eighteen humidity needs 55-60% and during hatching period it remains about65-70%. When humidity increase excessively then its become slightly difficult to control it. We use dry paper to control it. If we need to increase it then manually spray water inside the machine.

The turning of egg manually done daily twice. Morning and early night may be best choice of time. But it is also done in the morning and afternoon. This method is also supported by other studies.

Obtained average hatchability from this study is about 80%. According to Davis et al., (1988) hatchability for ideal incubator should be around 80%. So prepared incubator match this parameter. In another experiment we can see that selection of egg is also play an important role in the hatching percentage. First problem of egg selection is its difficult to know either the hen mated or not. That means in rural area the selected egg may contain or may not contain the male pro nuclei. So if we ensure that the egg contain male pro nuclei then the hatching percentage will increase.

CHAPTER: 4

CONCLUSION

Incubation process it is very important to maintain temperature and humidity. In our experiment our hatching rate is about 80 %. The total preparation cost is about 5000tk and the operation cost per batch was about 500tk. The capacity of the prepared incubator is 200 eggs per batch. So it is quite cheap and also effective. So this could be a revolutionary technology for the rural areas of Bangladesh.

In order to get proper result close observation is must. We need to monitor everything upto 21 days. We must give extra emphasis when electricity is not available specially during rainy season in rural areas. When electricity is not available we monitor humidity and temperature by using HTC meter.

So we can see that the incubator that we prepared has so many facilities as well as some constrains. If we overcome the constrains it will be the best prospectus of Bangladesh. Besides this people need mild training about incubation process so that they can maintain everything easily.

CHAPTER: 5

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