ABSTRACT

An experiment was conducted to assess the effects of egg weight on hatchability a to evaluate hatchability between Fayoumi and Sonali breeds of chicken in Govt Poultry Farm,Rangpur at the year of 2018. Simple random sampling technique was employed to select 288 hatching eggs; 144 eggs from each parent stock of Fayoumi and Sonali breeds were set into the incubator. According to the finding,hatchability was highest for Fayoumi breed than Sonali breed. Breed difference has no significant effect on hatchability, though, there is difference in hatchability between the two breeds. Early embryonic death is highest for Fayoumi. This difference is statistically significant ($p<0.05$). Late death is highest for the Sonali breed. This is highly significant ($p<0.01$). Death after hatching is highest for the Sonali breed. Post hatch performance of chick is not affected by breed. Post hatch performance of chick was not affected by egg size. Finally, breeds having better hatchability, proper egg handling and nest hygiene were recommended.

Key words: Chicken, Rangpur, sonali, fayoumi, hatchability.

INTRODUCTION

The contribution of poultry sector as an important tool in global efforts to overcome malnutrition and poverty in developing countries is widely recognized. It is often represents a farmer's first investment in the livestock ladder (followed by goats/sheep and then cattle) as a way of increasing income and emerging from the poverty trap. It is estimated that 10 million of poultry population are existing on whole over the world (FAO, 2015). Mostly chickens or other poultry are reared in tropical countries based on the traditional scavenging system.

In Bangladesh, poultry is one of the most important agricultural subsectors and about 87% of rural household rear poultry, with an average flock size of 6.9 birds (Apu and Saleque, 2012). This sector is dynamic and has potential for rapid poverty reduction through income generation and employment creation (Saleque, 2009; Dolberg, 2008). Commercially, this sector achieved a significant annual average growth rate of 15-20% in 1995–2007 (Saleque, 2009). The share of commercial poultry production by the private sector is expanding rapidly and now accounts for 50% of egg production and 60% of meat production (Bhuiyan, 2011). This sector supports the livelihoods of 6 million people directly and indirectly through 100000 commercial farms where total investment of 1875 million USD (Chowdhury, 2013). Currently there are 6 grandparent stock farms producing about 60000 to 70000 day old chicks per week and 140 parent stock farms producing 10.1 million commercial day old chicks per week, resulting in a production by the commercial farms of over 15000 tones of broiler meat and 2.4 million eggs per week (Khaled, 2015). Annual per capita egg consumption reached its highest level of 48 eggs in 2012, but this still represents a deficit of 53.85% compared with the minimum recommended requirement of 104 eggs per head per year. However, the net availability and per capita consumption of chicken meat and eggs increased steadily from 1995-96 to 2012-2013 (Raha, 2013).

In case of hatching of eggs, the term hatchability is used on the basis of total set for incubation. This must be detected as the percentages of eggs hatched out. Then hatchability of the chicks has been calculated by using the formulae.

$$\textbf{Hatchability} = \frac{\text{No. of hatched out chicks}}{\text{No. of total eggs}} \times 100$$

Fertility and hatchability are the major determinant of profitability in the hatchery enterprise (Peters et al., 2008). The climate and fertile eggs represent the hatchability on the basis fertile eggs (Amber, 1994). The hatchability of RIR ♂ X Fayoumi ♀ (i.e., Sonali) was found to be 86.8% (Islam *et al*., 2003). Hatchability of broiler hatching eggs was the parameters most influenced by the flock, environmental temperature and laying hens' stock (Al-Bashan and Al-Harbi, 2010). Apart from these, other factors that can have considerable influence on hatchability include nutrition of the breeding hen, genetic constitution of the embryo, disease, egg size, age and shell quality (King'ori, 2011). Egg weight, fertility, hatchability, and late embryonic mortality varied greatly between feed regimes (Lariviere et al., 2009).

Several factors influence hatchability of eggs like pre-incubation, storage time, fertility and incubation condition such as temperature, humidity, ventilation, position, egg turning and candling (Mussaddeq et al., 2002). It can also be impaired when the machine temperatures fluctuates (Lourens et al., 2005). Too low an incubation temperature often leads to dead but piped, large staggering chicks. The hatch is normally late and prolonged because the chicks do not dry off normally. In addition, reports that too high an incubation temperature can also lead to dead, piped embryos or chicks, which are small and sticky with a high incidence of unhealed navels. Often these chicks have deformed toes. Overheating in both setters and hatchers are one of the biggest reasons for down grading chicks (Deeming, 2000). Environmental temperature for the highest hatchability lies within the range of 37 to 38% and that tolerance to deviations to this temperature is a function of the duration to these exposures and to the stage of development (Decuypere et al., 2001). A significant and negative association of mortality with net profit, suggesting that increase in mortality would result in a decrease of net profit (Farooq et al., 2001).

Fayoumi, an ancient breed from the Egyptian City of Fayoumi for egg production, is well known poultry breed in Bangladesh. Now a day, it is a well established poultry breed throughout the world and is also popular breed in India, Pakistan, Sri Lanka and many other countries because of its high profitability with low cost. Farmers can easily rear this breed both in intensive and scavenging

systems and like it because of its bright color. Fayoumi is hardy, very precisions in early maturing and has excellent flying and escaping capacity (Chsen *et al*., 1987).It has upright tail and forward breast and neck and light-weight fowl. Cock is around 2kg and hen 1.6kg. They appear in a single comb, silver-white plumage on the head, with the rest black and white barring. Hen differs with the cock only have silver-white hue at the head and neck,they arehardy, well suited to hot climates and especially resistant to viral andbacterial infections. Hens are good layer and not given to broodiness butcan be when they reach two or three years of age. The breed shows rapidly growth or maturity. The pullets start laying a small egg when 4 months old, while the cockerels often grow at 6 weeks of age.

Sonali is a cross breed has come from the cross between RIR and Fayoumi. When RIR cock crossed with the Fayoumi hen then 60%breeds are red and 40% are black and white like Fayoumi. The body color of the Sonali breed is yellowish black and sometimes like Fayoumi but the neck feather and scales of the tarsus is also yellowish which same as ourindigenous breed. For rearing purpose this variety is the best under semiscavengingsystem. Small but now in our some government poultry farmthe vet officers are trying to produce the large eggs just cross between RIR cock and Sonali hen. The average body weight of the cock 2.5kgs and henis 2kgs. In our market most of the people buy it as an indigenous breed.This breed is really popular for its body color and indigenous tastes. The Sonali chickens were supplemented with maximum 45g feed/hen/day. These chickens are getting sexual maturity within 195-222days with producing more eggs of the best quality with the highest benefit. Egg quality wasfound to be better with the increased of age of the hens and increased food.In order to improve the genetic potential of a breed this Sonali breed is good. Therefore, if a selection procedure to maintain for this the production potential of Sonali should be adapted for better yield. Poultry industry is a practically agribusiness which started in Bangladesh during the time of eighties but disease hampers on this profitable sector. Sonali breeds are free from cholerae due to proper vaccination and this breed shows low percentages of death. Sonali DOCs were produced, representing about 35 percent of the country's total commercial broiler and layer production (Huque, 2011).

However, the main objective of this study is to detect the hatchability of fayoumi and sonali chicks.

MATERIALS AND METHODS

Study Area Discription :

The work was carried out to determine the hatchability of Fayoumi and Sonali chicks,which were reared under scavenging system. The experiment was conducted for a period of 2 months (February to March) at the northern part of Bangladesh(Rangpur).

Study Farm and its Management:

The study was carried out at Govt. Poultry Farm,Rangpur,situated in the center town. The farm reared RIR, Fayoumi and crossbred(*Sonali*) chickens. The specialty of this farm was that it provided a comparative account of rearing and productivity rate of *Sonali* chickens and good hygiene conditions.

Study design:

An experimental design was followed to evaluate hatchability in Fayoumi and Sonali breeds of chicken. Hatchability of eggs were determined based on hatched out chicks. Infertile eggs were detected by candling method. Eggs, which failed to develop embryo were regarded as infertile eggs. Candling to detect fertility was done after a week of incubation.The term hatchability is used by poultry men on the basis of total set for incubation. Hatchability was detected as the percentages of eggs hatched out.The collected eggs were selected on the basis of some parameters like medium size and fresh and clean and average weight. The average weight of Fayoumi eggs were 40 gm and Sonali were 42 gm, which were found from the randomly take the weight of 144 eggs of each genotypes.

Egg collection and storage: Prior to egg storage the eggs in each group were divided into 3 (>50 g large, 45 to 50 g medium and 42 to 44 g, small). Eggs were then stored for 7 days in a cool room at approximately 17°C and 75 relative humidity. The hatching eggs were then fumigated with potassium permanganate and Formalin before set.

Incubation and setting to hatchery: The incubator was set at 37.8°C with a RH of 55% for 21 days. Eggs were turned 90° hourly up to day 15. After 21 days of incubation, eggs were transferred to the Hatcher and set at 37.5°C with 75% relative humidity.

Candling of the egg: Eggs were candled on the 7th and 14th days of incubation to identify and remove infertile and eggs with dead embryos (dead in germ). The eggs which failed to develop embryo were regarded as infertile eggs. The rest of the eggs were transferred from the setter to the Hatcher on the 18th day of incubation and later on the 21st the Hatcher was opened.

RESULT

Mean hatchability was 86.8% for Fayoumi and 51.4% for the Sonali breed. There was significant difference in hatchability between the two breeds of chicken (Table 1).

Table1: Hatchability and fertility of Fayoumi and Sonali chicks

Breed	No. of eggs examined	Fertility	Hatchability	P value
Fayoumi	144	95.1%	86.8%	0.003
Sonali	144	91.6%	51.4%	

Table-2: Embryonic mortality of Fayoumi and Sonali chicken

Breeds	Total no. of eggs	Infertile eggs	Early death	Middle death	Late death	Death after hatch	Weak chick
Fayoumi	144	7 (4.86%)	4(2.8%)	0 (0%)	8 (5.5%)	0 (0%)	2 (1.4%)
Sonali	144	12 (8.3%)	0 (0%)	3(2.1%)	55 (38.2%)	3(2.1%)	3 (2.1%)
Total	288	19	4	3	63	3	5
P value	-	0.235	0.044	0.082	0.0014	0.082	0.652

Table 3: Effects of egg weight on Fertility and Embryonic mortality

Size of eggs	No. of eggs	Infertile eggs	Early death	Middle death	Late death	Death after hatch	Weak chick
Small	65	2 (3.1%)	2 (3.1%)	1 (1.5%)	10(15.3 %)	0 (0%)	0 (0%)
Medium	142	7 (4.9%)	2 (1.4%)	1 (0.7%)	29(20.4 %)	0 (0%)	2 (%)
Large	81	10(12.3 %)	0 (0%)	1 (1.2%)	24(29.6 %)	3 (%)	3 (%)
Total	288	19(6.5%)	4(1.3%)	3(1.04%)	63(21.8 %)	3(%)	5(%)
P value	0.048	0.287	0.843	0.014	0.295	0.215	

Among the eggs set to the incubator, the number of eggs unfertile in the case of Fayoumi breed was 7(4.86%) in number and 12(8.3%) in Sonali. This is not statistically significant ($P>0.05$) but there was statistically significant difference ($P<0.05$) between the two breeds of chicken eggs and early embryonic death. Early embryonic death in Fayoumi breed 4(2.8%) was higher than in the Sonali breed 0(0%) (Table 2). Egg weight has significant difference on fertility of chicken and late embryonic death ($p<0.05$). However, there was no statistically significant difference between egg weight and early and middle embryonic death and death after hatch and weak chick ($P>0.05$). Highest infertility rate was observed in larger eggs 10(12.3%) than the smaller eggs 2(3.1%). Late death was 24(29.6%) and 10(15.3%) in larger and smaller eggs respectively (Table 3).

DISCUSSION

The finding of this study showed that breed difference has significant effect on different hatchability parameters . This has conformity with the study of Durmus et al. (2010) which states that late period embryonic mortality, hatchability of fertile eggs and early embryonic mortality differs between genotypes. Islam et al. (2002) also showed that difference in breed had significant effect on the different hatchability parameters as these characters are genetically controlled. Jull (1951) also reported genetic constitution had some effect on embryonic mortality. The finding of this study is therefore in line with the fact that hatchability performance of eggs depends on genetic factors in addition to others. Kamphues et al. (2001) also indicated that hatchability is influenced by genetic factors. Rahman (1995) indicated that hatchability is mainly affected by environment. In addition to inappropriate incubator conditions, increases in embryo deaths early in incubation can be indicative of inappropriate egg handling procedures, pre-incubation storage conditions and dietary toxins. Deaths in the middle period (8 to 18 day in chickens) are usually few. Any increases during these period are usually ascribed to nutritional problems notably vitamin or mineral deficiency (Leeson and Summers, 1991). Hatchability, hatching time, embryonic mortalities, chick weight at hatch and chicks developmental performance at post hatch period is directly affected by hatching egg weight (Baspinar et al., 1997). Both high and low water losses increased embryo mortality in the latter half of incubation. High water losses can obviously result in death of the embryo through dehydration, whilst low water losses are indicative of low conductance eggshell that probably contribute to embryo deaths through asphyxiation. The weight and composition of the chick is affected further by the time between hatching and removal from the Hatcher and this time affects post-hatching performance of the chick (Wyatt et al., 1985).

According to this study, larger egg has lower hatchability followed by medium eggs. Smaller egg has good hatchability. This result is consistent with Ogunshile and Sparks (1995); French (1997) result stated that larger egg has got increase in late mortality of embryo. An explanation for increased late embryonic mortality due to increasing egg size was that larger eggs would be expected to have greater difficulty initially achieving adequate embryonic temperature and then losing embryonic metabolic heat during later incubation (Lourens et al., 2005). Malago and Baitilwake (2009) also indicated that late embryonic mortality and hatchability in heavier egg are higher as compared to lighter eggs.

CONCLUSIONS

From the current finding, it is concluded that breed had significant effect on hatchability. In addition to breed difference, egg weight has significant effect on hatchability. The result indicated that small egg ranging in size between 42 and 45 g would be suitable for setting in order to get good hatchability . Based on the aforementioned conclusion, breeds have better hatchability, proper egg handling and nest hygiene, measurement of hatchability

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