Bangladesh Journal of Veterinary and Animal Sciences, Vol. 8, No. 1, January-June 2020

ISSN 2227-6416

Bangladesh Journal of Veterinary and Animal Sciences

Journal homepage: www.bjvas.com

Research article

Fertility, hatchability and livability up to first laying age of Aseel and F_1 of Hilly (Red Jungle × Hilly) chicken under intensive rearing system

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A R T I C L E I N F O

Article history:
Received: 12/12/2018
Accepted: 12/02/2020

Keywords:
Fertility, Hatchability, Livability, Aseel and F_1 of Hilly.

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A B S T R A C T

A study was conducted between June 2008 and May 2009 on Aseel and F_1 of Hilly chicken under intensive rearing system at Chattogram district of Bangladesh. Livability, fertility and hatchability are the key features to poultry breeders. Because poor fertility and low hatchability incur loss in breeding operations and less livability significantly impact net returns. Therefore, higher fertility and hatchability and lower mortality of birds should be of direct interest to the poultry breeders. Hence the aim of this study was to estimate fertility, hatchability and livability up to first laying age of Aseel and F_1 of Hilly chicken. The Aseel and F_1 of Hilly chickens were collected from the Sarail Upazila of Brahmanbaria district and hill tract regions of Bangladesh. After collection, the chickens were kept in breeding flock as male and female ratio 1:1. The egg was stored in room temperature and hatched by the electric incubator. Fertility of Aseel and F_1 of Hilly chicks was found to be 95% and 75%, respectively. The hatchability of Aseel and F_1 of Hilly chicken based on fertile eggs was detected 94.74% and 86.67% but in case of total eggs the hatchability of the two genotypes was 90% and 65%, respectively. Livability of Aseel and F_1 of Hilly chicks up to first laying age was 88.89% and 46.15%, respectively. The first laying age of both Aseel and F_1 of Hilly were 210 and 180 days, respectively. Based on fertility, hatchability and livability, Aseel chicken was better than F_1 of Hilly chicken. So, the former breed is better for conservation issue than the later in the ex-situ conservation system.

To cite this paper: *O.F. Miazi, M.K.I. Khan, G. Miah, M.M. Hassan and S.A. Khan, 2020. Fertility, hatchability and livability up to first laying age of Aseel and F_1 of Hilly (Red Jungle × Hilly) chicken under intensive rearing system. Bangladesh Journal of Veterinary and Animal Sciences, 8(1):74-79.*

1. Introduction

Indigenous chicken population is composed of a number of breeds/types such as non-descript Deshi, Aseel, Naked Neck and Hilly (Bhuiyan et al., 2002). Approximately 140 million chickens are scattered throughout 68,000 villages in Bangladesh which mostly of indigenous non-descript type (Bhuiyan et al., 2005). Native chickens belongs a special genetic niche evolved

by natural selection which is crucial to the continued poultry production in the country (Bondoc, 1998). Aseel is well known for its pugnacity, high stamina, majestic gait and dogged fighting qualities. Therefore, Aseel is, known to every game lover all over the world for these specific characteristics. These birds are also known for its plentiful delicious and flavoured meat (Sharma and Chatterjee, 2006). This indigenous game birds (Aseel) are found in Sarail Upazila in the Brahmanbaria district and in the Chittagong region. The genetic distance among indigenous chicken population is very short and small, whereas this distance very prominent and long within Deshi and Asset relatively. In Chittagong hill tract and adjacent Myanmar area, one type of bird namely-Hilly chicken is found which is well adapted in local environment, relatively more disease resistance with prominent broodiness (Khan et al., 2007). Fertility is a very important parameter for the breeding chicken. It is considered as the total actual reproductive capacity of females and males expressed by their ability when mated together to produce offspring. An egg is said to be infertile when it fails to show any evidence of developing embryo (Warren, 1953).The ability of the embryo to successfully escape from the shell is called hatchability (Tarek, 1992). Good hatchability of eggs is to some extent heritable but is determined by a complicated genetic constitution and the environment (Amber, 1994). Livability is the potentiality of an individual to survive up to its normal life. In chicken, life begins just after fertilization and continues until death (Khan, 2003). Livability means the percentage of live birds for a specified time, which affects the productive and reproductive performance of poultry. Livability of chick is a final measure of a bird's reproductive performance (Anisuzzaman, 1988).

The traits livability, fertility and hatchability are of paramount importance to poultry breeders, because they incur loss in breeding operations. Poor fertility, low hatchability and less livability significantly affect net returns (Azizul et al., 1980). Therefore, higher fertility of hatching eggs, higher hatchability of fertile eggs and lower mortality of birds should be of direct interest to the poultry breeders as well as the hatchery operations (Banerjee, 1993). Poultry breeders must look into these three traits of significance to overcome the problems of infertility, poor hatchability and low livability (King'ori, 2011). Livability of Hilly chicken under intensive management was 96.67% (Khan et al., 2007) and the egg production was 78% per year. The indigenous chickens have undergone unknown periods of natural selection and are a reservoir of excellent genetic diversity. They show high level of morphological and phenotypic variability and increased fitness under natural settings. No attempts have been made to improve and conserve these genetic resources and they are going to be extinct. Conservation programmes with the indigenous Aseel and F_1 of Hilly chickens at the smallholder village levels (*in-situ*) of Bangladesh are yet to be tested. There was no study before about F_1 of Hilly chicken. Such an initiative may help to save these creatures from the grip of the threat of extinction. The objectives of this study were to observe the fertility, hatchability and livability up to first laying age of Aseel and F_1 of Hilly chicken.

2. Materials and Methods

The experiment was conducted for 10 months including 4 weeks adaptation period in farmers homestead in the Eastern part, Chittagong district between June 2008 and May 2009. The Aseel and F_1 of Hilly collected from the villages and local markets. The birds quarantined for 15 days and vaccinated against Newcastle disease before transferred in layer shed. The male and female chicken distributed in each pen at a ratio 1:1. The collected egg stored and hatched by electric incubator. Fertility, hatchability and livability up to first laying age have been detected. At the same time first laying age was also detected. Fertility and hatchability of eggs were also determined based on fertile eggs and hatched out chicks. Fertility has been detected by using the following formula.

$$\text{Fertility} = \frac{\text{No. of fertile eggs}}{\text{No. of total eggs}} \times 100$$

The term hatchability is used by poultry men in two senses: i) hatchability based on total eggs set for incubation and ii) hatchability related to the

fertile eggs. Hatchability was detected as the percentages of eggs hatched out. Then hatchability of the chicks has been calculated by using the following formulae.

i) Hatchability based on total eggs =

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

ii) Hatchability base on fertile eggs =

$$\frac{\text{No. of hatched out chicks}}{\text{No. of fertile eggs}} \times 100$$

Then the livability up to first laying age was detected by using below formula.

$$\text{Livability} = \frac{\text{No. of live chicks up to specified time}}{\text{Total chicks}} \times 100$$

The first laying age of Aseel and F_1 of Hilly chicken were detected from the day of hatch out of chicks to the date of first egg laid by hens. The collected data were analyzed by using the statistical program of computer, Microsoft Word, Microsoft Excel.

3. Results and discussion

Fertility and Hatchability

The fertility of Aseel chickens was detected 95 % on the other hand fertility of F_1 of Hilly chicken was detected 75% (Table 1). The fertility of Aseel was found higher than the F1 of Hilly chicken. The comparative study showed that fertility is lower in nondescriptive Deshi than Aseel but similar in F_1 of Hilly. Salauddin et al., (1995) found the fertility of nondescriptive Deshi was 75%. The fertility depends on various factors such as breed, season, pre-incubation holding period,

Table 1: Fertility of Aseel and F_1 of Hilly chicken

Parameter	Total eggs	Fertile eggs	Fertility (%)
Aseel	20	19	95
F_1 of Hilly	20	15	75

lighting, level of nutrition, mating and time of mating (Singh, 1975; Silversides and Scott, 2001). Fertility of eggs depends on various factors such as breed, variety, shape index, season, pre-incubation, holding period, storage temperature, humidity, rate of egg production, level of nutrition, breed type, mating and time of mating. Lighting and sperm quality play a significant role in the processes of fertilization (Jull, 1970; Yeasmin, 2000). Temperature is a major factor for the production of the fertile eggs. It has been reported that fertility is affected badly during both hot and cold weather (Crawford, 1984). In the past study on chicken species the overall fertility rate was 88.6 in Fayoumi and Sonali chicken 89.8% (Miazi et al., 2012). This result supported that the fertility rate vary breed to breed and it is always higher in chicken.

The hatchability of Aseel and F_1 of Hilly chicken based on fertile egg was detected 94.74% and 86.67% but in case of total eggs the hatchability of the two breeds was detected 90% and 65%, respectively (Table 2). The hatchability was found higher in case of Aseel compared to F_1 of Hilly chicken both in case of fertile egg as well as total egg. One of the past studies by Barua (1990) found the hatchability of non-descriptive Deshi was 75% but the present study result found hatchability higher 90% in case of Aseel and lower 65% in case of F_1 of Hilly chicken.

The overall hatchability rate was 86.0% in Fayoumi, which was lower than Sonali 87.5% (Miazi et al., 2012). There are several factors including genetic makeup, care of hatching eggs, storage temperature, moisture, age of broody birds, quality of eggs, seasons, nutrition influenced the hatchability of fertile eggs (Gringer, 1964; Kingan et al., 1964; Kamphues et al., 2001). Hatchability of eggs is to some extent heritable but determined by a complicated genetic constitution. Factors that can cause the developing embryo to fail to get out of the shell are varied in nature (Cowan and Michie, 1978). Both high and very low moisture contents in the weather badly affect the hatchability but the moderate moisture content of the air enhances better result (Das et al., 2005). This result supported that the hatchability rate vary breed to breed and it is also affected by the environmental factors.

Table 2. Hatchability of Aseel and F_1 of Hilly chicken

Parameter	Total eggs	Fertile eggs	Hatched out chicks	Hatchability (%) based fertile eggs	Hatchability (%) based on total eggs
Aseel	20	19	18	94.74	90
F_1 of Hilly	20	15	13	86.67	65

Livability

The overall livability of Aseel and F_1 of Hilly chicks up to first laying age was found 88.89% and 46.15%. The livability of F_1 of Hilly chick was lower (46.15%) and that was significantly different from Aseel (88.89%) ($p < 0.05$). The livability of Sonali chicks in the intensive system and semi-intensive rearing was 90.8% and 94.4% (Islam et al., 2004), which is higher than the present work of Aseel and F_1 of Hilly in intensive system was 88.89% and 46.15%, respectively. Livability of Hilly chicken under intensive management was 96.67% (Khan et al., 2007) and the egg production was 78 per year. The overall livability of Fayoumi chick after 8-week in scavenging rearing system was 58.2% whereas the overall livability of Sonali chick was 49.4% (Miazi et al., 2015). In the present study livability differed between two breeds possibly because of their differences in genetic makeup and reared in scavenging condition. The livability was found very low in case of F_1 of Hilly because of this genotype yet not adopted in our environment. Without this the rearing system was intensive which also not supported for more livability due to this genotype was little bit adopted in scavenging rearing system.

First laying age

The average age at sexual maturity of Aseel and F_1 of Hilly was 210 days and 180 days respectively (Table 4). The findings of age and weight at sexual maturity of Hilly chickens are in agreement with the findings of Islam et al. (2003), they observed the age at sexual maturity of hilly chickens were 160-195 days. The age at first lay of nondescriptive Deshi was 190-225 day (Huque and Haque, 1990). This observation indicated that F_1 of Hilly chicken attains early maturity and Aseel chicks are near to similar with before result. Sexual maturity of pullets may also be influenced by the factor like temperature, nutrition and lighting intensity (Maeda et al.,1988; Uddin, 1989).The average first laying age of Fayoumi was found 202 days was less than that of Sonali 220 days (Miazi , 2008). From the above discussion, we can conclude that first laying age varied in several varieties, types and breed but early first laying age was found in case of F_1 of Hilly.

Table 4. First laying age (days) of Aseel and F_1 of Hilly chicken

Location	Breed	
	Aseel	F_1 of Hilly
Chittagong	210	180

Conclusion

The current study revealed that Aseel chicken are highly vigorous in size but they are too much gentle, friendly, having tendency for fighting instant of fear. On the other hand, F_1 of Hilly chicken is small in size, not friendly, having the capacity to fly. The fertility of Aseel chickens was found 95 % on the other hand fertility of F_1 of Hilly chicken was found 75%. The hatchability of Aseel and F_1 of Hilly chicken based on fertile egg was detected 94.74% and 86.67% on the other hand in case of total eggs the hatchability of the two breeds was detected 90% and 65%, respectively. The overall livability of Aseel and F_1

Table 3. Livability of Aseel and F_1 of Hilly chicks

Breed	Total eggs	Hatched out chicks	Remaining up to First laying age	Livability up to First laying age
Aseel	20	18	16	88.89
F_1 of Hilly	20	13	6	46.15

hilly chicks up to first laying age was found 88.89% and 46.15%. Livability was found very low in case of F_1 of Hilly because of this genotype yet not adopted in our environment. The first laying age of Aseel and F_1 of Hilly were 210 days and 180 days respectively. Based on fertility, hatchability and livability up to first laying age, Aseel chicks were better than F_1 of Hilly. So, the former breed is better for conservation issue than the later in the ex-situ conservation system.

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