

Performances of Nageswari duck of Bangladesh under intensive management condition

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Abstract

The present study was conducted to know the production and reproduction potentials, and egg quality characteristics of Nageswari duck under intensive management condition. Data were collected from a nucleus flock of Nageswari ducks that have been maintained from day old to 72 weeks of age at AI center, Bangladesh Agricultural University, Mymensingh, from May 2015 to October 2016. Irrespective of sex, the average live weight of ducklings at day old, 1st, 3rd, 5th, 7th and 9th weeks of age were observed to be 38.85±1.40, 99.06±2.93, 373.29±8.73, 650.31±11.26, 867.74±11.79 and 1076.11±16.34 g, respectively. There was a steady increasing trend observed in live weights for both drakes and ducks from 17th to 72 weeks of age. The average age of sexual maturity and weight were found 130±1.83 days and 1400.84±12.68g respectively. The average egg weight and annual egg production were 58.20±1.50g and 204.23±14.19 no's, respectively. Hen day egg production was found 55.67±2.74% while the peak production was observed at 26th week of age. The estimated mean egg mass production (g/b/day), feed intake(g) during laying, feed conversion efficiency and performance efficiency index of Nageswari duck were 32.40±2.29, 154.85±2.27, 4.63±0.21 and 20.92±1.37, respectively in Nageswari duck. The external egg quality characteristics like shape index, egg breaking strength, shell thickness and membrane thickness were observed to be 74.59±0.61, 2.00±0.03 kg/cm², 3.99±0.06 mm and 0.50 ± 0.02 mm respectively whereas, internal quality attributes such as albumen index, yolk index, yolk color score and Haugh unit were 8.89±0.29, 34.36±0.61, 8.42±0.28 and 86.29±1.06, respectively. In conclusion, the studied parameters of Nageswari duck provided some breed specific baseline information and year round actual production potentials of this genetic resource under intensive management condition that could be utilized for future conservation and breeding programs in Bangladesh.

Key words: growth, production, reproduction, egg quality, Nageswari duck

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Introduction

Small-scale duck rearing has potential contribution to household economy, food security and improving the nutritional status of the rural people in Bangladesh. Duck stands second position in terms of total egg and poultry meat production in Bangladesh (Das *et al.*, 2008). Total duck population in the country has been reported to be 47.25 million (BER, 2013), of which 95 percent are of indigenous or non-descript type scattered throughout the country (Hoque and Sultana, 2003). Besides, Khaki Campbell, Indian runner and Jinding, and their crosses are being reared by limited farmers in some duck populated areas due to have better production. Indigenous ducks are preferred by the farmers under traditional scavenging system due to their high adaptability to farming

conditions, better foraging ability, long productive life and less affected by diseases (Pervin *et al.*, 2013; Morduzzaman *et al.*, 2015). Traditionally, farmers used to maintain a small duck flock along with their chickens throughout the country. However, large-scale duck farming ranging from around one hundred to thousands is found particularly in the north-eastern and coastal regions of the country where the land ecology, agro-climatic condition and natural feed resources largely influence on duck population demography (Khanum *et al.*, 2005). In addition, the abundant low laying river basin areas, marshy lands, beels, haors, and canals of the country make good option for profitable duck farming by rural householders (Rahman *et al.*, 2009).

Nageswari is an egg type indigenous duck breed which sparsely distributed in the Barak valley

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basin areas of India and Bangladesh. They are also locally called "Nagi" or "white breasted Nagi" due to their head-high snake like posture (snake deity) with white stripe in the neck extending up to breast (Islam *et al.*, 2002; Zaman *et al.*, 2005). The bluish tinge egg and completely black or penciled black plumage color except breast region are the characteristic features of this breed. The original homeland of this breed is believed to be the erstwhile Sylhet district of Bangladesh (Zaman *et al.*, 2005). The Barak Valley basin is surrounded by hills and rivers with abundance of surface water and agricultural fields. Duck farming has traditionally become popular among the people of these regions. Over the years, the rampant crossbreeding with exotic breeds leads to gradual disappearance of pure Nageswari duck in their homeland and there is a risk of extinction this germplasm in near future. Now it is hard to find them in their place of origin (personal communication). However, better concentration of this breed was found in the duck potential areas of Mymensingh, Kishoreganj and Netrokona districts (Morduzzaman *et al.*, 2015).

Previous studies reported quite large variation in the productive and reproductive performances of Nageswari duck with its, management and data collection perspective. Relatively lower egg production per year (120 to 150 numbers) of Nageswari ducks under scavenging conditions in Assam (Islam *et al.*, 2002; Sharma *et al.*, 2003 and Zaman *et al.*, 2005) was recorded compared to Valavan *et al.* (2009) who found more than 200 eggs per year under intensive management condition. Khatun *et al.* (2012) reported egg production rate of Nageswari duck up to 52 week of age was $55.40 \pm 2.36\%$ under farmer's condition of Bangladesh. On the contrary, indigenous ducks of Bangladesh are low

productive, lay only 60-80 eggs per year (Rahman *et al.*, 2009; Pervin *et al.*, 2013). However, information is scanty about their actual capabilities in terms of production, reproduction and egg quality attributes under proper feeding and management condition. Establishment of database on production and fitness traits are the first and foremost requisites before taking any conservation and breeding scheme for a breed or species. Therefore, the study was designed to know the year round production and reproduction potentials as well as egg quality attributes of Nageswari duck under intensive management condition.

Materials and Methods

Establishment of a nucleus flock

This study was conducted at Artificial Insemination (AI) Center, Bangladesh Agricultural University, Mymensingh from May 2015 to October 2016. A total of 122 day old ducklings was collected from selected duck farms in Tarail Upazila of Kishoreganj district mainly based on phenotypic features of breeding flocks. Ducklings were brooded up to 3 weeks of age and then, growing ducklings were reared on floor. Individual selection was performed twice at the age of 9th and 16th weeks based on their growth performance and phenotypic features conform to breed characteristics. Details on morphology and morphometric features of Nageswari duck were described in the previous study by Morduzzaman *et al.* (2015). Finally, forty Nageswari ducks (34 female birds and 6 male birds) was kept as nucleus flock and were individually tagged using leg band.

Table 1. Nutrient composition of ration supplied to experimental Nageswari duck*

Nutrients	Starter (0-4 weeks)	Grower (5-17 weeks)	Pre-laying (18-19 weeks)	Laying (20-72 weeks)
ME(Kcal/kg)	2700-2800	2500-2600	2600-2700	2600-2700
CP (%)	20-21	14-15	16-17	18-19
Lysine	0.80	0.70	0.78	0.88
Methionine	0.40	0.29	0.32	0.36
Met.+ Cysteine	0.58	0.42	0.62	0.70
Calcium	1.10	1.00	2.75	3.00
Avai. phosphorus	0.50	0.50	0.48	0.52

*Vitamin- mineral premix was added at a rate of 0.5 kg per 100 kg feed.

Feeding and management practices

Hand mixed mash feed was provided twice daily (morning and evening) throughout the experiment periods while commercial compound starter feed was provided only for first 4 weeks. Feeder and waterer were cleaned daily prior to feed supply in the morning and clean water was supplied ad libitum twice daily. The nutrient compositions (Table 1) of the supplied rations were given as per requirements of duck ration (NRC, 1994). Ducks were vaccinated against duck plague and duck cholera as per manufacturer's recommendation. Photoperiod was adjusted to 16 hours/day by providing artificial light during the laying period. During day time, ducks were allowed to stay 6-7 hours in a small pond nearby the shed. Sufficient egg laying boxes were given and egg laying place (laying box or floor) was recorded to know the laying behavior of duck. Strict bio-security measures and hygienic control were maintained for obtaining healthy environments of ducks.

External and internal egg quality characteristics

A total of 24 fresh eggs were collected from the flock at the age of 35 weeks to investigate external and internal egg quality attributes according to the methods outlined by Chowdhury (1987) and Ferdous *et al.* (2015). The egg quality characteristics included egg length, egg width, shape index, egg breaking strength, egg surface area, egg volume, egg density, shell thickness and membrane thickness, albumen index, yolk index, yolk color score, yolk weight (%), albumin weight (%) and Haugh unit (HU).

Record keeping and data analysis

Data on live weight and feed consumption were recorded weekly in the flock up to 20 weeks of age and then, were recorded monthly interval up to 72 weeks of age. Egg production and egg laying behavior were recorded regularly while egg weight data were recorded fortnightly. Besides, disease incidence and mortality rate was also registered. Based on the recorded information, several production efficiency indicators like hen-day egg production (%), annual egg production/duck, egg mass production (g/bird/day), feed conversion efficiency and performance efficiency index were estimated. Descriptive statistics such as mean, standard error, frequency, percentage and graphs were performed to represent the data using Microsoft Excel 2013.

Results and Discussion

Body weight

Growth performances of straight run Nageswari ducklings under intensive management condition up to 9th week of age are presented in Table 2. The average live weights of ducklings at day old, 1st, 3rd, 4th, 5th, 6th, 7th, 8th and 9th week of age were observed to be 38.85 ± 1.40 , 99.06 ± 2.93 , 373.29 ± 8.73 , 457.09 ± 15.89 , 650.31 ± 11.26 , 884.9 ± 22.36 , 867.74 ± 11.79 , 933.48 ± 19.65 and 1076.11 ± 16.34 g respectively. The values obtained by Morduzzaman *et al.* (2015) were almost similar to the present observation. On the other hand, Islam *et al.* (2014) found the average weight (36.24 ± 2.90 g) of day old Nageswari duckling which was little lower than the present findings. However, Khatun *et al.* (2012) reported 8th week live weight of Nageswari duckling was observed to be 1090.06 ± 122.84 g at farmer's level with supplementation which is little higher than the present study.

On the contrary, Sharma *et al.* (2003) and Zaman *et al.* (2007) reported quite lower live weight of ducklings up to 8 weeks of age under farmer's condition. The difference between present and previous studies might be due to availability of feed, nutrient contents in the feed, investigated sample size and management practices. After 9th week, live weight of male and female ducks were recorded separately up to 72 weeks of age and is presented in Figure 1. There was a steady increasing trend observed in live weights after 17th week in both sexes. The average body weight of Nageswari male and female duck at 23 weeks of age was 1.43 and 1.42 kg which are similar with the previous observation of Islam *et al.* (2002). However, Zaman *et al.* (2007) reported adult body weight of Nageswari duck to be varied from 1.60 to 1.66 kg in males and 1.45 to 1.50 kg in females that was a bit higher than the present investigation.

Productive and reproductive performances

The productive and reproductive performances of Nageswari ducks under intensive management condition are presented in Table 3. In this study, the average age and weight at first egg (AFE) of Nageswari duck were found 130 ± 1.83 days and 1400.84 ± 12.68 g, respectively.

Table 2. Growth performances of Nageswari ducklings up to 9th week of age

Week	Number of observation	Weight (g)		
		Min	Max	Mean ± SE
Day old	38	24	56	38.85 ± 1.40
1st	52	47	138	99.06 ± 2.93
3rd	37	291	477	373.29 ± 8.73
4th	32	250	588	457.09 ± 15.89
5th	57	385	904	650.31 ± 11.26
6th	42	620	1112	884.90 ± 22.36
7th	57	602	1136	867.74 ± 11.79
8th	36	620	1090	933.48 ± 19.65
9th	37	791	1280	1076.11 ± 16.34

Table 3. Productive and reproductive performances of Nageswari ducks up to 72 weeks of age

Parameter	Mean ± SE
Age at first egg (day)	130 ± 1.83
Weight at sexual maturity (g)	1400.84 ± 12.68
Hen day egg production (%)	55.67 ± 2.74
Annual egg production/duck	204.23 ± 14.19
Average egg weight (g)	58.20 ± 1.50
Egg mass production (g/bird/day)	32.40 ± 2.29
Feed intake during laying (g/day)	154.85 ± 2.27
Feed conversion efficiency	4.63 ± 0.21
Performance efficiency index	20.92 ± 1.37

Khatun *et al.* (2012) reported about a half month higher age at first egg (147± 3.64 day) and almost similar weight (1455 ± 41.23 g) at the time of sexual maturity compared to the present investigation under farmer’s condition. Morduzzaman *et al.* (2015) reported that average age at first egg of Nageswari breed was 162.67 ± 5.90 days under farm condition and 174.29 ± 1.16 days under farmer’s level. Both investigations were higher than the present findings. Sharma *et al.*(2003) found average age at first egg to be 181.94±1.57 days whereas, Zaman *et al.*(2005) and Islam *et al.*(2002) reported that average age at first egg (AFE) of Nageswari duck was 188 days with a range of 174-198 days and 180-195 days respectively. It revealed that significantly earlier age at first egg

was observed compared to other previous investigations. It might be due to the supply of sufficient amount of balanced feed and better management particularly in the early stage could accelerate growth performance and attain earlier puberty in duck.

Hen day egg production

Figure 2 represents the hen-day egg production of Nageswari duck under intensive management practices. Hen day egg production was found 55.67±2.74% and average annual egg production was 204.23±14.19. This result is in accordance with the findings of Valavan *et al.* (2009) who reported average annual egg production to be 200-220 in Nageswari duck under intensive management system. Khatun *et al.* (2012) found 55.40 ± 2.36 % egg production rate up to 52

weeks of age in Nageswari duck which is relatively lower than the present study (60.19 ± 3.63) considering the same age of hen day egg production. Study also revealed from Morduzzaman *et al.* (2015) that total number of eggs laid per year ranged between 146 and 201 with an average egg production of 173.63 ± 3.39 eggs and is relatively lower than present observation. This difference might be due to imbalanced ration formulation, insufficient feed supply and also poor management practices.

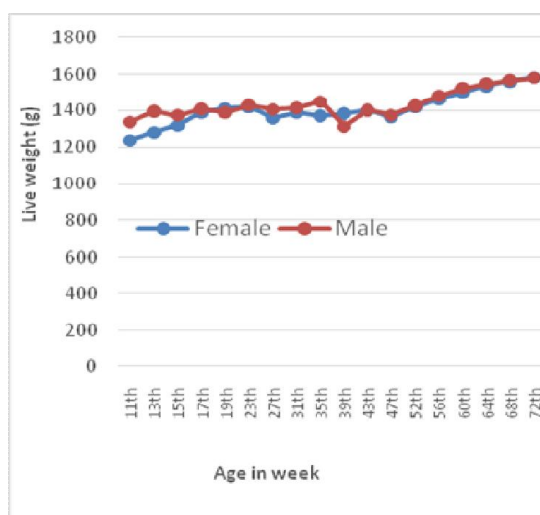


Figure 1. Growth performances of Nageswari male and female duck up to 72 weeks of age

However, in the present study, ducks reached their peak production at 26th week of age. Considering annual egg production, there were 5 laying peaks depicted by their highest egg production concentrating at 26, 36, 44, 54 and 70th week of age and the tenure of each laying cycle persisted in and around 45 days (Figure 2). On the other hand, Zaman *et al.* (2005) and Mahanta *et al.* (1998) reported higher egg laying cycles (6-7 cycles) each consisted of around 28 days in Nageswari and Chara-chamballi ducks. It is suggested that laying cycle could be extended through providing required amount balanced feed, better management and selection of good layers.

Egg weight and laying behavior

The average egg weight was estimated as being 58.20 ± 1.50 g in the present study (Table 3). This result is in accordance with the findings of

Khatun *et al.* (2012) who reported average egg weight to be 57.22 ± 1.89 g in Nageswari ducks. In addition, almost similar egg weight (56-60g) was reported both in Bangladeshi indigenous and Indian Nageswari duck (Das and Hoq, 2000; Islam *et al.*, 2002; Rahman *et al.*, 2009). Higher egg weight also reported by Sharma *et al.*(2002) in Nageswari duck (62.45g) and Mahanta *et al.*(2009) in Chara-chamballi duck (71.6g) of Assam. Egg weight increased linearly with age despite the difference was insignificant from 26 to 72 weeks of age (Figure 3). Relatively smaller eggs might be a breed characteristic features of Nageswari ducks as revealed by the findings of present and earlier studies. Unlike to chicken, we found only 40% ducks lay eggs in the laying box even though sufficient laying nests were provided in the shed.

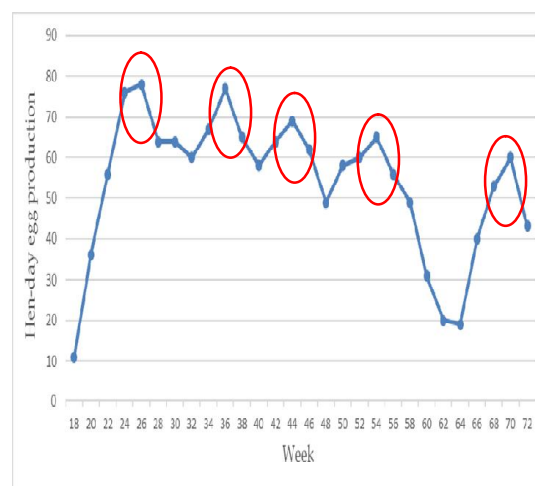


Figure 2. Year round hen-day egg production of Nageswari duck under intensive management condition. Year round egg laying peaks are presented with red round circles.

Feed consumption, feed conversion efficiency and mortality

The average feed consumption and feed conversion efficiency during laying (g/b/day) period was 154.85 ± 2.27 g and 4.63 ± 0.21 respectively in Nageswari duck. The present study shown that egg mass production (g/b/day) was 32.40 ± 2.29 and performance efficiency index was 20.92 ± 1.37 (Table 3). However, lack of information on feed consumption and conversion efficiency particularly in ducks limits the scope to compare with other studies. The mortality rate of the present study was found

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6.0, 4.67 and 3.0% during the periods of day old to 8 weeks, 9 to 19 weeks and 20 to 72 weeks of age respectively. The mortality rates of the present study are within the range as reported by Khatun *et al.* (2012).

Table 4. External and internal egg quality characteristics of Nageswari duck¹

Parameter	Mean ± SE
Egg weight (g)	55.56 ± 0.87
Egg length (mm)	56.04 ± 0.52
Egg width (mm)	41.74 ± 0.19
Shape index	74.59 ± 0.61
Egg breaking strength (kg/ cm ²)	2.03 ± 0.03
Egg surface area (cm ²)	67.19 ± 0.67
Egg volume (cm ³)	51.86 ± 0.77
Egg density (g/cm ³)	1.063 ± 0.00
Shell thickness (mm)	0.39 ± 0.06
Membrane thickness (mm)	0.50 ± 0.02
Albumen index	8.89 ± 0.29
Yolk index	34.36 ± 0.61
Yolk color score	8.42 ± 0.28
Yolk weight (%)	32.37 ± 0.38
Albumin weight (%)	51.73 ± 0.68
Haugh unit (HU)	86.29 ± 1.06

¹fresh eggs were investigated from the flock at the age of 35 weeks for internal and external egg quality characteristic

On the other hand, Morduzzaman *et al.*(2015) reported that mortality rate was 2.0% up to 2 months and 1.5% from 2 months to adult stage in Nageswari duck which is lower than the present findings. In other studies, Islam *et al.*(2002) and Sharma *et al.*(2003) reported much higher mortality (below 10%) of adult Nageswari ducks in Assam. Actually, mortality rate is primarily depending on immune status and management system of the flock and therefore, difficult to compare across flocks under different management practices.

External and internal egg quality

The mean external and internal egg quality characteristics are shown in Table 4. The external egg quality characteristics like egg weight, egg length, egg width, shape index, egg breaking

strength, egg surface area, egg volume, egg density, shell thickness and membrane thickness were recorded to be 55.56 ± 0.87 g, 56.04 ± 0.52 mm, 41.74 ± 0.19 mm, 74.59 ± 0.61, 2.00 ± 0.03 kg/cm², 67.19 ± 0.67 cm², 51.86 ± 0.77 cm³, 1.063 ± 0.00 cm³, 3.99 ± 0.06 mm and 0.50 ± 0.02 mm respectively. Similarly, internal egg quality characteristics shown that the albumen index, yolk index, yolk color score, yolk weight(%), albumin weight (%) and Haugh unit (HU) were 8.89 ± 0.29, 34.36 ± 0.61, 8.42 ± 0.28, 32.37 ± 0.38, 51.73 ± 0.68 and 86.29 ± 1.06 respectively. Above mentioned egg quality characteristics are very much close to the previous findings of Khatun *et al.* (2012) and Palanivel *et al.* (2011). On the other hand, present results are also in agreement with the findings as reported by Sharma *et al.* (2002).

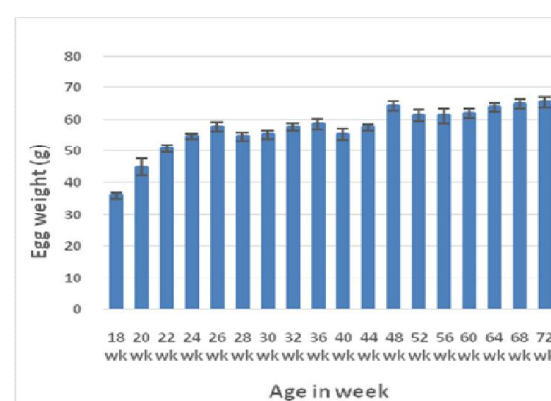


Figure 3. Relationship between age and egg weight of Nageswari duck

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Conclusion

Above all, this study reported growth performances, year round actual production and reproduction potentialities of Nageswari duck from the recorded data of a nucleus flock that maintained under intensive management condition. Egg production potentialities were found almost 2.5 times higher than available indigenous ducks. Therefore, this finding revealed that Nageswari duck as promising indigenous duck genetic resource that that need to be conserved immediately for further genetic erosion.

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