

DUCK GENETIC RESOURCES, THEIR IMPROVEMENT AND CONSERVATION IN BANGLADESH: A REVIEW

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ABSTRACT

The present article addresses the scenario of duck genetic resources, their production and reproduction performances, their improvement and conservation in Bangladesh. The duck, among other poultry species available in the country, are used for meat and egg production. The duck germplasm available in the country are indigenous/native, improved native, exotic and their crosses. The native duck population is comprised of Indigenous Non-descript, Deshi White, Deshi Black, Nageshwari, Sylhet Mete etc. The improved native such as, BLRI-1 and BLRI-2 are developed by Bangladesh Livestock Research Institute. The exotic duck such as, Khaki Campbell, Indian Runner, Jending, Muscovy, White Pekin, Cherry Valley, Thailand Black etc. are also used at farms level. The crossbred of different ducks are used in the country at different farming systems. Improvement and conservation of native duck are ongoing both *in-situ* and *ex-situ in vivo* by DLS, BLRI, BAU and also by others. The present study provided baseline information on duck germplasm of Bangladesh which could be useful for future genetic characterization, improvement and conservation.

Keywords: Bangladesh, Duck, Germplasm, Conservation

INTRODUCTION

Ducks among other poultry species is considered as an economic livelihood option in Bangladesh especially for smallholders and women. In Bangladesh, the rural peoples raise ducks in adjunct with other agricultural operations where usually no extra feed is required. They are commonly tended for meat and egg under traditional system in rural areas (FAO, 1990). Ducks play a vital role for income generation, nutritional fulfillment and employment generation in the low-lying areas of Bangladesh (Islam et al., 2003). The people rear ducks with low inputs and obtain quick returns in terms of egg and meat which are usually for domestic consumption and also a source of

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good quick earning. It is an important component of farming system and plays a significant role to 80% rural people of Bangladesh. It provides cash income and creates employment opportunity for rural people, particularly for small and landless farmers.

Duck genetic resources of the country are composed of indigenous or native, improved native, exotic and their crosses. Most of the duck populations in the country are native duck like Pati (Deshi), Nageswari, Sylhet Mete, Cinahanh which have been well adapted to local climate and are considered to be dual purpose. The rest are exotic breed like Indian Runner, Khaki Campbell, Jending, Pekin and Muscovy (Sing and Moore, 1978; Huque and Hossain, 1991). The Bangladesh Livestock Research Institute conducted several experiments to improve the native ducks under intensive management and developed two improved native such as, BLRI-1 and BLRI-2 (Khatun and Islam, 2010). The crossbred ducks are also found in the country in different farming systems.

Ducks have several advantages over other poultry species, particularly in disease tolerance (FAO, 1990). In Asia, most duck production is closely associated with wetland rice farming, particularly in humid and sub-tropic zones. An added advantage is that ducks normally lay most of their eggs within the three hours after sunrise compared with five hours for chickens enabling them to collect those eggs in the morning while at home before going for outside work. This makes it possible for ducks to freely range in the rice fields by day, while being confined by night. Non-descript local ducks are ubiquitous in the country and most smallholder farmers keep them under a subsistent level of management in Bangladesh (Islam et al., 2003). It appears that the ducks can be raised cheaper than broiler if the market is properly organized.

Duck eggs are quite large compared to chicken eggs (1.4 times), which makes them easily distinguishable. The duck egg contains relatively less water and higher percentage of protein and fats in the yolk, albumen and total contents of egg as compared to chicken egg. Because of higher percentage of fat, its energy value is also higher than chicken eggs. Duck eggs are richer in flavour than chicken eggs, have better baking quality, longer storage life and people allergic to chicken egg can also consume duck eggs. Duck eggs have higher levels of vitamins and minerals with 12-13 nutrients than chicken eggs. Ducks eggs are less prone to cracking than chickens; as the shell membrane is very strong, it prevents leaking even if the shell is broken. Also, ducks may make for nicer backyard occupants. Owners find that ducks eat slugs and weeds and have a less aggressive pecking order than chickens. Duck are larger in size and the meat ducks are sold at a price higher than that of local free-range live chicken. Therefore, indigenous ducks both generate income and ensure protein for the people. Consequently, they are believed to act as an indispensable “*change maker*” in the rural economy of Bangladesh.

Although Bangladesh has rich in duck germplasm unfortunately, due to lower productive and reproductive performances and lack of public and private initiatives to accelerate, the development of duck sub-sector is sub optimal. Insufficient number of hatcheries for quality duckling in the country is one of the major reasons for non-accelerated growth of duck sub-sector. However, there are no documented research studies so far that investigated the duck genetic resources, their improvement and conservation. The purpose of this study is to address the available duck germplasm with their distributions, productive and reproductive performances along with conservation status so that the duck producers and researchers can get information for future improvement and conservation program.

Geographic distribution of different genotypes of duck

The ducks in Bangladesh are distributed throughout the country especially in low-lying areas that are around the river, canal, ditches, ponds and natural surface water reservoirs. Indigenous ducks are well adapted to the agro-climate conditions of the country. The breed/types of duck, their geographic distribution and importance are presented in Table 1.

Table 1. Geographic distribution and importance of duck in Bangladesh

Genetic diversity	Breed/Type	Geographic distribution	Agro-ecological Zone	Importance
Indigenous	Non-descript Deshi	Kishoregonj, Netrokona, Sylhet, All over Bangladesh	All agro-ecological zones	Well adapted to scavenging system & disease resistant
	Desi White	All over Bangladesh	All agro-ecological zones	Well adapted to scavenging system & disease resistant
	Desi Black	All over Bangladesh	All agro-ecological zones	Well adapted to scavenging system & disease resistant
	Nageshwari	In Sylhet district in the south east	All agro-ecological zones	Well adapted to scavenging system & disease resistant
	Sylhet Mete	In Sylhet district in the south east	All agro-ecological zones	-
	Indian Runner	All over the country		Egg
	Khaki Campbell	All over Bangladesh	All agro-ecological zones	Egg
Exotic	Jending	Duck farms and selective places of the country		Egg
	White Pekin	Limited to duck farms in the public sector	-	Meat
	Muscovy	Limited to duck farms in the public sector	All agro-ecological zones	Meat

Genetic diversity	Breed/Type	Geographic distribution	Agro-ecological Zone	Importance
	Indigenous X Khaki Campbell, Indigenous X Indian Runner, Indigenous X Jending	All over Bangladesh	All agro-ecological zones	Meat and egg
	Crossbred Jending X Thailand Black, Indian Runner X Thailand Black, White Pekin X Thailand Black			
	White Pekin X Thailand Black	Bangladesh University's poultry farm	Agricultural	Ongoing cross - breeding program

Source: FAnGRBD, BLRI, 2015; BLRI, 2004

Population of duck compared to chicken in Bangladesh

Duck population has been estimated at 54.016 million occupying second position in poultry in Bangladesh (DLS, 2018). Dolberg (2008) stated that, Bangladesh has the third largest population of duck after China and Indonesia. DLS (2012) mentioned that, duck population represents 8% to 25% of the total population of chicken. There are different types of duck rearing system available in the country. It can be classified as house hold (scavenging), semi-intensive (semi scavenging) and intensive farming (Khan et al., 2013). Majority of the population of duck are reared by the small holders in coastal and low-lying areas under scavenging system, with little or without supplementation. According to the DLS of Bangladesh the total duck population is steadily increasing, from 45.7 million in 2013 to 54.016 million in 2018. The duck population in Bangladesh is commonly tendered for meat and egg. In nature, they are reared under traditional system in rural areas (FAO, 1990).

In Bangladesh, there are eight government hatcheries operating to produce and distribute ducklings to duck producers all over the country, which is far below the demand, especially in the Haor basins. The production of ducklings in government hatcheries are presented in Table 2.

On an average, duck and chicken ratio is 1:5 in the country. It also gives information on duck population distribution. The proportion of duck within the poultry population is high in the Barisal division (1:3), which is located in the South-west and, in Sylhet (0.69:1) located in the North-east of the country. This is due to presence of large number of ponds and water bodies that are suitable for duck production.

Table 2. Duckling production in government hatcheries (2016-17)

Name of the hatchery	Total Layer	Total Duckling
Narayangonj	2570	222780
Dowlatpur	1372	130235
<i>Kishoregonj</i>	0	0
Naogaon	1528	103025
Sunagaji, Feni	940	69219
Gopalganj	1154	87697
Sunamgonj	971	35540
Rangamati	1272	11771
Total	9807	660267

Source: DLS, 2018

Available duck genetic resources in Bangladesh

Similar to chicken, Bangladesh has got different types of duck germplasm and they are reared through different systems in different regions of the country. The duck germplasm of the country have been described below:

A) Native duck

The native duck population is comprised of a number of breeds/types such as Indigenous Non-descript, Deshi White, Deshi Black, Nageshwari, Sylhet Mete etc. in respect of the morphological variations as well as production performances. The former three native ducks are used widely at farm levels. Native ducks were probably evolved through natural selection. The domesticated ducks belongs to the genus *Anas* and species *platyrhynchos*. In Bangladesh 90 to 95% of the ducks reared by village farmers are of Deshi type, which are very poor in egg production. But presently the tendency of rearing highly productive indigenous ducks is increasing day by day in the country in rural sides. The phenotypic features and their frequencies of Nageswari duck are presented in Table 3. The body measurements of Nageswari duck are presented in Table 4.

Table 3. Phenotypic features and their frequencies of Nageswari duck

Trait	Sex	Characteristic features	Frequency (%)
Head color	Male	Black	92.31
		White spotted black	7.69
Neck color	Female	Black	100
	Male	Black	100
Breast color	Female	Black	100
	Male	White	84.62
		Black	15.38
Back color	Female	White	93.75
		Black	6.25
	Male	Black	100
Wing color	Female	Black	100
	Male	Black	100
Tail color	Female	Black	100
	Male	Black	100
Bill color	Male	Black	57.69
		Black with yellowish tint	23.07
		Yellowish	19.23
	Female	Black	93.75
		Black with yellowish tint	6.25
Bean color	Male	Black	100
	Female	Black	100
Shank color	Male	Black	73.07
		Black with yellowish tint	7.69
		Yellowish	19.23
	Female	Black	90.63
		Black with yellowish tint	9.37
Skin color	Male	White	100
	Female	White	100
Eye color	Male	Black	88.46
		Ash	11.54
	Female	Black	84.38
Web color	Male	Ash	15.62
		Black	76.93
	Female	Black with yellowish tint	23.07
		Black	87.50
Egg color	Male	Black with yellowish tint	12.50
		Bluish	100

Source: Morduzzaman et al., 2015

Table 4. Body measurements of Nageswari duck

Parameter	Male (Mean \pm SE)	Female (Mean \pm SE)
Body Weight (kg)	1.66 \pm 0.07	1.51 \pm 0.05
Body length (cm)	26.27 \pm 0.57	23.79 \pm 0.39
Head diameter (cm)	3.49 \pm 0.02	3.36 \pm 0.04
Bill length (cm)	5.87 \pm 0.09	5.54 \pm 0.07
Neck length (cm)	23.49 \pm 0.58	21.59 \pm 0.49
Shank length (cm)	5.76 \pm 0.12	5.16 \pm 0.11
Wing length (cm)	24.58 \pm 0.49	21.99 \pm 0.53
Massiveness	6.33 \pm 0.28	6.39 \pm 0.22
Condition index	6.72 \pm 0.23	6.93 \pm 0.23

Source: Morduzzaman et al., 2015

B) Improved native duck

Bangladesh Livestock Research Institute (BLRI) has developed two types of native duck through long time selective breeding (Islam et al., 2014). The ducks are named as BLRI-1 and BLRI-2.

C) Exotic duck

The Khaki Campbell, Indian Runner, Muscovy and Jending are the exotic ducks which are used widely at farms level and the White Pekin, Cherry Valley and Thailand Black are limited in some duck farms in the public sector. The Khaki Campbell and Jending are to be considered as valuable duck genetic resources in the country. The preliminary studies showed that Khaki Campbell and Jending are medium sized egg laying duck having potentials to survive well and giving very good production (Pervin et al., 2013).

D) Crossbred duck

Although the crossbred of different ducks are used in the country in different farming systems, but unfortunately no information was recorded/available in this cross breeding program. Presently, some cross breeding program is running by Department of Livestock Services (DLS) and Bangladesh Agricultural University (BAU). The DLS started cross breeding of different ducks, such as Jending X Thailand Black, Indian Runner X Thailand Black, White Pekin X Thailand Black since the end of 2017 in their own farm. The Department of Poultry Science of BAU has running a cross breeding program of White Pekin X Thailand Black since middle of 2018.

Production and reproduction performances of duck in Bangladesh

The duck in Bangladesh are mainly used as dual purpose such as egg and meat production. The production and reproduction performances of duck of different germplasm are summarized as below:

A) Performances of native duck

The production and reproduction performances of Indigenous Deshi ducks are summarized in Table 5. The production and reproduction performances of Nageshwari duck are summarized in Table 6. The production performances of Deshi ducks with Khaki Campbell and Jending are summarized in Table 7.

Table 5. Performances of Indigenous Deshi ducks

Trait	Average
Adult body weight (kg)	1.60
Feed consumption (g/duck/day)	178.13
Age at onset of lay (d)	126.0
Age at peak production (d)	213.0
Egg production at the peak (%)	77.0
Duck house egg production (%)	44.0
Mean egg weight (g)	71.17

Source: BLRI, 2001

Table 6. Production and reproduction performances of Nageswari ducks

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

Source: Bhuiyan et al., 2017

Table 7. Production performances of Khaki Campbell, Jending and Deshi ducks

Parameters	Khaki Campbell	Jinding	Deshi
Total number of egg production	111980	161000	15000
Average no. of egg production	220	230	150
Average egg weight (g)	65.20	64.30	58.70
Total egg mass production (kg)	34.67	34.19	31.69
Egg mass production (g/bird/day)	26.80	30.72	15.65
Age at sexual maturity (days)	168	157	194
Survivability (%)	94.70	97.48	96.60
Egg production % of TNEP	60.28	63.01	41.09

Source: Islam, 2015

B) Performances of improved native duck

The production and reproduction performances of improved BLRI-1 and BLRI-2 are summarized in Table 8.

Table 8. Production and reproduction performances of BLRI-1 and BLRI-2 ducks

Parameters	BLRI-1 (Mean \pm SD)	BLRI-2 (Mean \pm SD)
Age at sexual maturity (day)	158 \pm 0.95	151.75 \pm 1.15
Female weight at first lay (g)	1444.29 \pm 20.56	1456.22 \pm 24.94
Egg weight at first lay (g)	48.87 \pm 0.40	49.50 \pm 0.50
Egg production (%) at 40 wks of age	55.17 \pm 1.04	53.85 \pm 2.03
Egg weight (g)	68.56 \pm 6.54	63.04 \pm 5.38
Duckling weight (g)	40.10 \pm 4.35	36.24 \pm 2.90
4th week body weight (g/duck)	378.95 \pm 84.43	359.22 \pm 103.24
8th week body weight (g/duck)	846.71 \pm 148.06	844.43 \pm 165.82
12th week body weight (g/duck)	1399.91 \pm 20.20	1313.05 \pm 22.90
Fertility (%)	65.98 \pm 10.36	59.59 \pm 5.89
Embryonic mortality (%)	24.94 \pm 4.15	35.81 \pm 18.65
Hatchability (%) on fertile eggs	72.62 \pm 16.95	77.86 \pm 21.55

Source: Islam et al., 2014

C) Performances of exotic duck

The production and reproduction performances of Khaki Campbell and Jending with Deshi ducks are summarized in Table 7. The Performances of Indian Runner, Khaki Campbell and Jending in integrated duck cum fish farming system are summarized in Table 9. The performances of exotic ducks are satisfactorily at farm levels.

Table 9. Performances of Indian Runner, Khaki Campbell and Jending in integrated duck cum fish farming system

Parameters	Indian Runner	Khaki Campbell	Jending
Initial body wt. (g)	580.00	584.00	581.00
Body wt. gain (up to start of egg laying kg/duck)	1.55	1.51	1.48
Mortality (%)	3.00	4.50	3.50
Egg production (%)	68.00	70.00	61.00
Egg weight (g)	61.00	60.50	58.00

Source: Das et al., 2003

Improvement and Conservation of Duck Genetic Resources

In Bangladesh, the improvement and productivity of duck yet has been under utilized and less emphasis through pedigree selection and breeding (Ukil and Islam, 1991; Salam and Uddin, 1987). Research and development on duck farming is still limited to laboratories and pilot fields, therefore, the dissemination of research results has yet to reach the ultimate beneficiaries.

For the improvement of duck, the ducklings of Khaki Campbell, Indian Runner, Jending, native ducks are being produced in the government duck hatcheries and distributed among the interested farmers at subsidized price to popularize duck farming. However, no organized breeding programme for rural duck production has yet been formulated and implemented in the country. The Central Duck Breeding Farm of Narayanganj is working on different duck farming methods and breeding program. Presently, some cross breeding program is running by the Department of Livestock Services (DLS) in their own farm for the improvement of duck in Bangladesh.

Bangladesh Livestock Research Institute (BLRI) initiated native duck breeding program to conserve five types of native ducks since 1999. Since then, several experiments have been conducted to improve the productivity of native ducks under intensive management. Thus, phenotypic, productive and reproductive characteristics of two native ducks were improved by selective breeding (Khatun and Islam, 2010). After verification, comparative better performers of two native ducks were named as improved ducks of BLRI-1 and BLRI-2.

Bangladesh Agricultural University also has a Department of Poultry Science with undergraduate, graduate, and post-graduate degrees, specializing on Poultry. Many research works are carried out by the students and faculties which are useful for the improvement and conservation of duck in Bangladesh.

There are many *haors* and *bills* in Kishoreganj and Sylhet where water body is available for the maximum time in the year, e.g. Etna, Mithamoin, Baniachong,

Azmiriganj, Jokiganj, Fenchuganj, Salla, Dirai, Dharampasha, Tahirpur, Sunamganj sadar, Durgapur, Khaliajuri etc. Ducks are found in adequate quantity in Kishoreganj, Netrokona, Sylhet, Sunamgonj and Kurigram.

CONCLUSIONS

From the above discussion, it may be concluded that Bangladesh is rich in duck genetic resources. These serve well in fulfilling nutritional requirement of the country and income generation for millions of people. There is scope to improve the productivity of Indigenous duck through appropriate breeding and husbandry practices. This study represents useful resources for future study of duck genetic resources in the country.

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