



Characterization and performance evaluation of indigenous geese of Assam

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ABSTRACT

The present study aimed to phenotypically characterize the indigenous geese of Assam, in North East India. These geese were observed to have two types of plumage colour (white and cinnamon) and plumage pattern (solid and bordered); and three different bill colours (black, orange, yellow). The shank and feet colour was found to be mostly orange and sometimes yellow. The eye colour was found to be black, brown and sometimes grey and skin colour as white. The least squares means for body weight at hatching, 4, 6-8 and 12 months and above age were 0.087 ± 0.001 , 3.030 ± 0.022 , 3.480 ± 0.055 and 3.970 ± 0.025 kg, respectively. The average age at first egg, annual egg production, clutch size and clutch interval were 320.196 ± 2.882 days, 19.886 ± 0.306 , 9.897 ± 0.143 and 59.206 ± 0.531 days. Average fertility and hatchability percentage under natural condition were found to be 87.11% and 80.53%, respectively. The study revealed that the indigenous geese of Assam are heavier birds with high potential for meat production with two colour variants, viz. White and Cinnamon in the study area covering four districts. The study generated baseline information on physical characteristics, productive and reproductive performances of indigenous geese of Assam under native field condition which would be of great help in documentation and development of breed descriptors for registration, improvement and conservation.

Keywords: Indigenous Geese, Phenotypic characterization, Productive performance, Reproductive performance

Geese are among the fastest growing avian species with disease resistance quality and are commonly raised for meat, large edible eggs and valuable products such as feather and down (National Research Council 1991). Assam, the gateway of North East India, cradles in its lap an indigenous germplasm of geese. They are locally called as '*Rajhanh*' meaning king of ducks. Generally rural people reared them in their backyard in traditional system of management with low input. Geese are let loose early in the morning for foraging and are housed during night hours in small houses made of locally available materials like wood, bamboo, trampolines, etc. They are provided with kitchen wastes, whole grains, rice bran, rice grains etc. after coming back to their houses. Farmers find geese rearing quite profitable. Indigenous geese are heavier birds and primarily reared for meat. Geese meat is nutrient dense meat and excellent source of protein, riboflavin, vitamins, omega-3 fatty acids and iron (Joseph 2019). Geese meat is considered as white meat. They act as a guard to household and biological weeder too. They can be easily managed by women folk. There is a belief that geese rearing signifies peace and prosperity of the household. They are also

donated in the temples and occupy an important position in religious ceremonies under Assamese culture since ancient time. To our dismay, they remain neglected and unnoticed species and no proper characterization has been done yet.

Characterization and inventory of poultry genetic resources are needed in countries where clearly defined poultry breeds are yet to be identified; therefore properly designed scientific studies on indigenous geese and duck breeds of India need to be prioritized (Tixier-Boichard *et al.* 2008). Hence, necessity of scientific study of the indigenous geese of Assam under native field condition to generate baseline information is felt which will be great help in documentation and development of breed descriptors for registration, formulation of breeding plan for improvement and conservation of this germplasm. This will help in popularization and recognition of this valued germplasm. Keeping in view of the above, the present study has been carried out to characterize Indigenous geese of Assam.

MATERIALS AND METHODS

The present study was carried out during the period from September 2020 to August 2021. Data were collected from a total of four districts of Assam, viz. Udalguri, Nalbari, Darrang and Barpeta district. These districts were selected after pilot survey and discussion with Veterinary Officers of different districts regarding availability of the

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indigenous geese. Data were collected following a random stratified sampling design. A total of four villages within each district were identified. Further, three households were selected from each village. Thus, a total of 16 villages covering 48 households within four districts were randomly selected for the study. Data pertaining to a total of 251, 686, 184 and 845 numbers of geese were utilized to study various physical characteristics; body weight; egg production and reproductive traits. Body weights were recorded at hatching, 4, 6-8 and 12 months and above age. Geese and gander were able to be distinguishable above 4 to 5 months of age, hence the body weight for 6-8 months and 12 months and above age groups were recorded separately for male and female (Fig. 1). The data collected were then compiled, computed and tabulated by using standard procedures. Suitable information on relevant parameters were collected from the farmers through field surveys, personal observations, interviews and providing questionnaires to farmers in different districts under study. The questionnaire was prepared as per the guidelines provided by National Bureau of Animal Genetic Resources, Karnal, Haryana for poultry genetic resources.



Fig.1. Pictures of (a) Female geese and (b) Male geese.

RESULTS AND DISCUSSIONS

Physical characteristics: Traits for physical characteristics included plumage colour, plumage pattern, bill colour, skin colour, shank colour, feet colour and eye colour. Per cent distribution of studied traits are presented in the Table 1. In accordance with present finding two types of plumage colours were also observed by Banerjee (2013) in the indigenous geese of West Bengal; Hamadani and Khan (2016) in Kashmir Anz geese; and Phookan *et al.* (2020) in Indigenous geese of Assam respectively. However, yellow, pie bald and black coloured geese which are native to Turkey was reported by Saatci *et al.* (2009). On the other hand, Joudka *et al.* (2012) reported that the Lithuanian Vishtines goose breed had only white plumage. The plumage pattern revealed in the present study corroborated with the observation by Phookan *et al.* (2020) in indigenous geese of Assam. Bill colour (black, orange and yellow) observed in the present finding was similar to the report of Phookan *et al.* (2020) in indigenous geese of Assam. Banerjee (2013) observed brown and orange coloured bill in Indigenous geese of West Bengal. Hamadani *et al.* (2020) observed bill colour as black,

yellow and intermediate in indigenous geese of Kashmir. Banerjee (2013), Islam *et al.* (2016) and Phookan *et al.* (2020) reported white coloured skin in indigenous geese of West Bengal, Bangladesh, and Assam respectively which was in harmony to the present finding. The finding of yellow and orange shank in indigenous geese of Assam corroborated with the findings of Hamadani and Khan (2016) and Phookan *et al.* (2020) in Kashmir Anz geese and indigenous geese of Assam. However, indigenous geese of West Bengal and Bangladesh had shown yellow shank as reported by Banerjee (2013) and Islam *et al.* (2016), respectively. Johnsgard (2010), Juodka *et al.* (2012) and Phookan *et al.* (2020) reported similar feet colour (orange and yellow) in Sheld goose of United States, Lithuanian Vishtines goose and indigenous geese of Assam respectively. Similar eye colour (black, brown and grey) was also reported by Phookan *et al.* (2020) in indigenous geese of Assam. Eye colour in Kashmir Anz geese was found to be either grey or brown (Hamadani and Khan 2016). Islam *et al.* (2016) observed dark brown and blue coloured eyes in indigenous geese of Bangladesh.

Table 1. Per cent distribution of different traits related to physical characteristics in indigenous geese of Assam at adult age

Body part	Adult Geese	Per cent (%)
Plumage colour	Cinnamon (brownish)	59.37
	White	40.63
Plumage pattern	Bordered	59.37
	Solid	40.63
Bill	Black	47.85
	Orange	32.37
	Yellow	11.42
	Mixer of Black and Orange	8.36
	Orange	
Skin	White	100
Shank	Orange	76.63
	Yellow	23.37
Feet	Orange	87.94
	Yellow	12.06
Eye	Black	61.43
	Brown	29.36
	Grey	9.21

Growth traits

Body weight: The LSM $\pm$ SE of body weight at hatching, 4 months, 6-8 months and 12 months and above age are presented in Table 2. Gander was found to be significantly ($P<0.01$) heavier than the goose at 6-8 months and 12 months and above age (Table 3). The recorded body weight at hatching was found to be in harmony with the observations of Hamadani *et al.* (2014) in indigenous geese of Kashmir and Boz *et al.* (2017) in artificially hatched Turkish geese. However, comparatively higher body weight of geese at hatching as compared to present finding were reported by Islam *et al.* (2016) in indigenous goose of Bangladesh and Boz *et al.* (2017) in naturally hatched Turkish geese. The average body weight of 4 month old geese from hilly terrain of Nilgiris as reported by Kumar *et al.* (2009) was

Table 2. Least-squares means and standard errors for body weight (kg) at hatching, 4 months, 6-8 months and 12 months and above age

Age group	Male	Female	Overall
Hatching	-	-	0.087±0.001
4 months	-	-	3.030±0.022
6 -8 months	3.602 ^a ± 0.092	3.358 ^b ±0.061	3.480 ± 0.055
12 months and above	4.128 ^a ± 0.042	3.813 ^b ± 0.026	3.970 ± 0.025

NB, Subclass means in a column with different superscripts differ significantly.

Table 3. Least-squares analysis of variance showing effect of sex on body weight at 6-8 months and 12 months and above of age

Sources of variation	6-8 months		12 months and above	
	d.f.	M.S.S	d.f.	M.S.S
Sex	1	0.616**	1	4.860**
Error	47	0.126	249	0.119

** p < 0.01.

comparable to the present report. Hamadani *et al.* (2014) found that the body weight of indigenous geese of Kashmir at 6 months, 12 months, 24 months and 36 months of age were lower than that of the present study, along with Kumar *et al.* (2009) in geese belonged to hilly terrain of Nilgiris at 6 months of age. The average body weights of adult geese as recorded by Islam *et al.* (2016), Kirmizibayrak and Kuru (2018) and Phookan *et al.* (2020) corroborated with the present findings. However, lower body weights in comparison to present findings were observed by Beer and Boyd (1962) in adult Pink footed geese of Slimbridge, England and Owen and Ogilvie (1979) in adult Barnacle geese of Spitsbergen. Comparatively higher body weights in adult Lithuanian Vishtine geese was reported by Juodka *et al.* (2012).

Performance traits

Egg weight: The average egg weight was 115.445±2.320 g. A comparable egg weight was recorded by Razmaite *et al.* (2014), Hamadani and Khan (2016), Sari *et al.* (2019) and Gogoi *et al.* (2021) as in Lithuanian Vishtines geese breed; in Kashmiri geese; in Lindovskaya (Linda) geese of Turkey, and in indigenous geese of upper Assam, respectively. However, a higher egg weight was reported by Bednarczyk and Rosinski (1999), Tilki and Inal (2004), Mustafa *et al.* (2005) and Saatci *et al.* (2009) in white Italian geese and Kuban geese; Native Turkish geese; in 1, 2 and 3 years old Turkish geese; in Turkish geese, in autochthonous Zator geese in Poland.

Egg production traits: The average age at first egg, annual egg production, clutch size and clutch interval were 320.196±2.882 days, 19.886±0.306 numbers, 9.897±0.143 numbers and 59.206±0.531 days, respectively. The indigenous geese of Assam undergo two laying cycles in a year and each laying cycle was found to be of range from 12 days to 1 month.

First laying cycle was generally seen in September to November months and second laying cycle in December to February month. The average age at first egg in the present study corroborated with the finding in indigenous geese of Assam; geese of West Bengal; indigenous geese of Kashmir and indigenous geese of Bangladesh as reported by Islam *et al.* (2002), Banerjee (2013), Hamadani *et al.* (2014) and Islam *et al.* (2016), respectively. On the other hand, a lower age at first egg were reported by Buckland and Guy (2002) in Houyan geese; Goussi and Fortomaris (2011) and Joudka *et al.* (2012) in Lithuanian Vishtines goose breed respectively. However, Lamon and Slocum (1922) found that Canadian and Egyptian geese did not lay until they were 3 years old. Comparable average annual egg production were reported by Islam *et al.* (2002) in indigenous geese of Assam; Clauer and Skinner (2007) in Canada and Egyptian geese; Banerjee (2013) in indigenous geese of West Bengal and Islam *et al.* (2016) in indigenous geese of Bangladesh. However, a higher average annual egg production was reported by Clauer and Skinner (2007) in Embden, African and Chinese geese breed. A higher annual egg production were recorded in Chinese and Zhedong goose breed by Goussi and Fortomaris (2011); and Qin *et al.* (2013) and Yu *et al.* (2016), respectively. White, Italian geese was observed to have a higher average annual egg production by Kuzniacka *et al.* 2019. On the other hand, a lower average annual egg production was recorded in Turkish geese by Tilki and Inal (2004); and in indigenous geese of Kashmir by Hamadani *et al.* (2014) Clutch size, clutch interval and laying cycle: Hamadani *et al.* (2014) and Islam *et al.* (2016) observed average clutch of in indigenous geese of Kashmir and Bangladesh which was comparable to the present finding. Contrastingly, Upadhyaya and Saikia (2012) reported a higher clutch size in cotton Pygmy goose of Assam. Kumar *et al.* (2009) recorded a slightly lower clutch size and a similar laying cycle in geese of hilly terrain of Nilgiris.

Reproductive traits

Fertility and hatchability (under natural condition): All the geese farmers adopted the practice of natural hatching by the use of broody goose. Hatchability percentage was calculated on total egg set (TES) basis. The average fertility and hatchability percentage of indigenous geese of Assam were 87.11% and 80.53%. Similar value as compared to present finding was reported by Mitrovic *et al.* (2018) in white Italian geese. However, lower fertility and hatchability in comparison to present result was reported by Gillette (1977) on Embden and Toulouse geese from U.S.

Broodiness: The indigenous geese of Assam were quite broody. During brooding period the female goose were observed to be reluctant to move out from the nest and they had a strong tendency to sit on the eggs (Fig. 2). The female showed marked broodiness two times in a year. The indigenous geese of Assam were found to be quite broody. Broodiness character was found to be very



Fig. 2. Geese eggs.

common in some Chinese goose breeds, such as Zhedong geese and Magang geese which was found to be almost over 90% (Qin *et al.* 2013 and Yu *et al.* 2016) and they found that the geese kept incubating in the nest even if the eggs taken away. However, Huoyan geese show relative weak broodiness (China National Commission of Animal Genetic Resources 2011).

To conclude, the indigenous geese of Assam are pristine germplasm of geese which are being reared from time immemorial. They are heavier birds with two colour variants, viz. White and Cinnamon. Large water bodies in the villages of the state always welcome geese rearing and farmers found it quite profitable. Apart from its socio-religious utility and its use as a special occasional delicacy cuisine, *Ranjhanh*, the indigenous geese of Assam has immense potentiality as a quality meat producer. They are well adapted to the local climatic conditions of Assam. Also, it can be emphasized that amongst the poultry, geese farming can be well acknowledged as there is scope for large profit using little or no inputs since they are heavier bird, mostly grass foragers and their management and production can be solely led by women in the household. Unfortunately, they could not gain much popularity like duck. Technological backup for breeding and management, attempt at market promotion and popularization of geese rearing are however warranted. Reducing broodiness by proper selection seems an easy feasibility for enhancing egg production and reproductive efficiency. Also, characterization of these non-descript indigenous geese is a need of the hour which will help in their registration as a breed.

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