



Morphometric characterisation and performance evaluation of *Bhangor* indigenous swamp buffalo population of Tripura

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ABSTRACT

An attempt was made to assess the phenotypic variability and study the management practices of indigenous swamp buffalo '*Bhangor*' population from the north-eastern state of Tripura. *Bhangor* buffalo animals have morphological features and behaviour similar to typical swamp buffalo. A survey was conducted in villages covering entire state, to record the phenotypic information. Adult animals are medium sized with compact body and used for draught and meat purpose. The horn is like sickle shaped (curved) with flat broad base and mostly corrugated, and curved upward to form a circle. Recently, for the first time, we had characterised *Bhangor* buffalo based on cytogenetic analysis as swamp type showing 2N=48 chromosomes. In present study, we had evaluated the reproductive performance and management practices. The buffalo provide valuable draught power in paddy fields. The indigenous population are important and much needed for the local communities as they are most suitably adapted to their natural habitat. At present only few swamp buffalo population are left in the country, and the germplasm of this population needs to be conserved.

Keywords: Bhangor, Indigenous, Morphometric, Swamp buffalo, Tripura

The buffalo are incredibly important animal to the people. The domestic buffalo (*Bubalus bubalis*) stands next only to cattle in its utility, mainly through its contribution in the form of milk in the central and western part of India, while in the northeast they are used for draught power. In India, we have 19 registered defined breeds of buffalo (ICAR-NBAGR, 2021) and various non-descript indigenous populations which need further characterisation both phenotypic as well as using molecular markers. '*Luit*' is the registered swamp buffalo population, found in upper Assam Brahmaputra valley and bordering areas of Manipur and Nagaland. Tripura is one such state in North-East India where buffalo were not elaborately characterized.

The two distinct buffalo (*Bubalus bubalis*), the dairy riverine and draft swamp differing in their cytogenetic constitution, have descended from different wild Asian water buffalo (*Bubalus arnee*) populations, and then evolving in separate geographical regions. The swamp buffalo were first domesticated in the lower Yangtze region of China (Sun *et al.* 2019) which further dispersed to South-east Asia, China and India (Lau *et al.* 1998, Lei *et al.* 2007, Yindee *et al.* 2010). The north-eastern parts of India form a continuous land-link with East Asian countries, which is

the home of swamp buffaloes. Based on mitochondrial (mtDNA D-loop) haplotype analysis, it has been concluded that the swamp buffalo came into existence when pre-domestication haplogroups SA and SB from the Chinese mainland reached south Asian region (Wang *et al.* 2017), highlighting the importance of the north-eastern region of India as evolutionary grounds for the swamp and riverine buffaloes. This has been confirmed by the presence of riverine and swamp hybrid buffaloes in Assam area (Mishra *et al.* 2015). Swamp buffaloes are reared mainly for draught power in the paddy fields. Morphologically, swamp buffaloes are small in size and tend to wallow in water (Borghese *et al.* 2005).

The Sanskrit name of the state Tripura is linked to the Hindu goddess of beauty; '*Tripura Sundari*', the presiding deity of the Tripura Sundari Temple at Udaipur. Tripura is one of the oldest kingdoms, it finds mentioned in the Mahabharata. Tripura is a land-locked state with hilly terrain running from the northwest to the southeast direction, with alternating narrow valleys. Geographically it is bounded from three sides with international boundary of Bangladesh, and very narrowly it joins with the Indian states of Assam and Mizoram to the east. Covering an area of 10,491 km² (4,051 sq mi), it is the third-smallest state.

Most of the buffaloes of the northeast region resemble swamp type in their external morphological features with characteristic small to medium compact body size and low milk yield. Buffalo populations in the north-eastern region

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are yet to be precisely classified. 'Bhangor' buffalo is also known as *Manipuri* by local people, since the animals closely resemble *manipuri* swamp buffalo animals. The indigenous people of Tripura are tribal settled in due course from different areas during early British era to evade prosecution, and in early time may have brought these animals with them. *Bhangor* buffaloes are found to be of pure domesticated swamp type based on their karyotypic profile (Singh *et al.* 2021). Here we had attempted to classify and characterise the phenotypic variability of indigenous buffalo population from Tripura state using morphometric measurements.

MATERIALS AND METHODS

Morphometric data collection: Data pertaining to habitat, distribution, management practices, utility, performance and socio-economic status of the farmers rearing 'Bhangor' buffalo were collected during the pilot survey conducted in Tripura. Morphometric data on standard traits as described in the breed descriptor for buffalo of ICAR-NBAGR, Karnal was recorded from 230 adult animals from West Tripura, Khowai, Dhalai, Unakoti, Gomati, and North Tripura districts of the state. Blood samples were also collected from unrelated animals of both sexes from various villages in the breeding tract. A total of 76 farmers from different villages were interviewed. The body measurements (body length, height at withers, heart girth, paunch girth, face length, ear length, horn length and tail length without switch etc) were recorded. The survey included 64 male and 166 female animals.

Cytogenetic analysis: The blood leukocyte culture method as described by Prakash *et al.* (2011) was used with slight modifications using RPMI 1640 medium with 2% phytohaemagglutinin (PHA) as a mitogen in 15 ml tubes under sterile conditions. The cultures were harvested using the standard procedure for the preparation of metaphase chromosome spreads after 72 h incubation at 37°C with intermittent shaking in the incubator. Screening of at least five spreads of each animal was attempted to confirm the results (as described in Singh *et al.* 2021).

RESULTS AND DISCUSSION

Distribution of buffaloes: Tripura is landlocked state and its physiography is characterised by hills and valleys. Buffaloes are distributed in the hills as well as valley/plain regions of different parts of the state. The state has nine major rivers, over 400 wetlands, and swamps most of which are waterlogged seasonal, providing natural habitat for swamp buffaloes to wallow (Wetlands of Tripura, 1997). The buffalo population of Tripura is estimated around 7,000 (20th Livestock Census 2019), 50% of which is found in Unakoti district alone. The southern parts of the state are covered under forest. Population of the animal is under threat and reducing over the years due to agriculture mechanisation. Clearing of forest and destruction of natural grazing lands are also of major concerns.

Cytogenetic characteristics of Bhangor buffaloes: The indigenous *Bhangor* buffalo have distinctive karyotypic features established for swamp type buffaloes. Blood samples (15) of both sexes collected from various locations were screened for cytogenetic analysis. Samples karyotype exhibited a diploid count of 2N=48 chromosomes, which is typical for swamp buffalo features (Bongso *et al.* 1984, Sat *et al.* 1987), the karyotype comprised 23 pairs of autosomes and a pair of sex chromosomes. The 23 pairs of autosomes contain 5 biarmed (metacentric/submetacentric) and 18 acrocentric chromosomes. Cytogenetic analyses thus confirmed the swamp status of *Bhangor* buffaloes of north-east India (Singh *et al.* 2021). Singh *et al.* (2020) had reported indigenous buffalo population from Meghalaya state, bordering with Indian state of Assam, based on cytogenetic analysis as swamp type.

Physical traits: Adult animals are medium in size as compared to riverine breeds, body colour generally grey to greyish-black, with strong compact legs. Hairs are brown tinged with some albino animals (light pink colour) also observed (Fig. 4). The horn is typical sickle shaped (curved) with flat broad base which is mostly corrugated and is curved upward to form a circle. The average horn length is 43 cm in adult animals. The ear is moderate in length (22



Fig. 1. Bhangor male buffalo.



Fig. 2. Bhangor female buffalo with calves.



Fig. 3. Young with typical white marking on neck.

cm), which is horizontally placed having hairs on inner and outer margins. The forehead is mostly convex. Muzzle has typical white markings on the lower jaw on both sides. Typical white or greyish-white colour is observed between hoofs to knee just like socks. The tail usually reaches upto hock having black tail switch. Animals have small udder with small teats, which are cylindrical with round or pointed tips. Naval flap was almost absent.

Young animals have prominent white stripes, one in the neck and another slightly above the brisket, which is another typical feature of the buffaloes, however it gets faded in the adult animals (Fig. 4). Temperament of animals is active and aggressive. As compared to indigenous buffalo of north-eastern states of Assam, Meghalaya and Manipur, there was no distinct physical trait based on which these buffalo populations could be differentiated.

The standard morphometric data recorded from adult animal were average body length, height at wither, heart girth, paunch girth, horn length, ear length, face length and tail length without switch in female were 103.78 ± 3.97 cm, 127.00 ± 1.30 cm, 175.67 ± 3.55 cm, 181.44 ± 2.92 cm, 43.11 ± 1.65 cm, 22.44 ± 0.34 cm, 43.11 ± 1.65 cm and 74.44 ± 2.42 cm, respectively. The corresponding estimates in male were 113.00 ± 5.25 cm, 135.35 ± 2.20 cm, 183.00 ± 5.21 cm, 188.00 ± 6.03 cm, 53.67 ± 5.58 cm, 23.33 ± 0.71 cm, 48.33 ± 2.25 cm and 84.83 ± 2.82 cm,



Fig. 4. Albino animals Bhangor buffalo.

respectively. The estimates of body length, height at wither, heart girth and paunch girth were within the ranges as reported from other indigenous population of Assam (Mishra *et al.* 2010b). The estimates of horn length were similar to the Manipur buffalo. The typical adult male and female animals are shown in Figs 1 and 2 respectively.

Management practices: The buffaloes were reared traditionally under zero input conditions. These buffaloes are exclusively maintained on grazing. During the paddy cultivation season (May to July), the buffaloes are used for ploughing the fields and for other agricultural operations. Animal field shelters having wood or thatched roof, which is open on two or three sides are common. Very rarely animals are housed during day time; housing for animals made with bamboos and rarely brick walls having tin shade was also seen in villages. Mostly animal housing, with no drainage system is constructed separately from the farmer's residence (76%). Floor of the animal houses were *kachchal* mud in all the cases. Housing patterns of the indigenous buffalo is shown in Fig. 5.



Fig. 5. Animal house.

Utility: Animal provide primarily draught power. Adult female buffaloes are mostly used as single animal to plough fields with locally designed ploughs. Revenue also generated from selling of young male calves. Milking is not done though milk yield varies between 1.5 to 2.5 litres per day. The fat percentage is high averaging about 8.5%. The buffaloes are also used as source of meat protein, especially during traditional festival sacrifice are done, though it has been banned by high court order. There is market for illegal trade operational across the international borders. Most of the animals were farm born. Calves reared mainly through suckling and colostrums feeding. Dehorning and de-worming practices were not adopted. Castration of young not practiced. Semen of indigenous buffalo is neither collected nor available for AI. Breeding was mostly through natural mating and in some villages along the International Bangladesh border, AI with Murrah semen has been started with tagged animals. Vaccinations for prevention of HS, FMD and BQ were observed.

Performance: The average age at first calving, daily milk yield, lactation length, dry period, service period, calving

interval, number of calving during life time were 2–3 years, 2.5 litres (2.5 to 4 litres), 200 days (180–240 days), 120 days (90–150 days), 70 days (90–120 days), 400 days (400–460 days), respectively. This is the first report on morphometric assessment of indigenous ‘Bhangor’ population from Tripura. Since there is a severe decline in the swamp buffalo population, it needs immediate intervention for breeding and conservation program for this unique germplasm.

The indigenous buffalo population showed uniformity in physical and morphometric traits and contributes significantly in the economy of the state due to its adaptation in the habitat. Management of animals across the states in the north-east region is almost similar, i.e. extensive type. However there is a need to enhance the productivity of indigenous buffalo through genetic improvement programs. Possibilities of organised livestock farming need to be explored as the state had good potential in this regard which may prove a boon for the tribal farmers to enhance their livelihood and nutritional security in the region. Since there is a severe decline in the swamp buffalo population, it needs immediate intervention for breeding and conservation program for this unique germplasm.

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