

Karyotypic and mtDNA Based Characterization of 'Bhangor' , Swamp Buffalo Population of Tripura

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Abstract

An attempt has been made to assess the phenotypic variability and to know the management practices of the indigenous swamp buffalo 'Bhangor' population in the Tripura state. The 'Bhangor' buffalo has morphological features and behaviour similar to typical swamp buffalo. Cytogenetic analysis showed 2N=48 chromosomes swamp karyotype. Mitochondrial D-loop phylogenetic analysis of the population with published known buffalo sequences clustered all 'Bhangor' buffalo samples into one clade with known swamp buffalo breeds. The buffalo provide valuable draught power in paddy fields. Besides the economic importance, the Bhangor buffalo population also helps to maintain the natural ecosystem, and the germplasm of this population needs to be preserved.

Keywords: Swamp Buffalo, mtDNA Analysis, Bhangor Buffalo



Introduction

In India there are 17 registered defined breeds of buffalo (ICAR-NBAGR, 2020) and various indigenous populations that need further characterization both phenotypic as well as using molecular markers. ‘Luit’ is the only domesticated Indian swamp buffalo population that is registered as a breed found in the upper Assam Brahmaputra valley and bordering areas of Manipur and Nagaland. Tripura is one such state in North-East where buffalo were not elaborately characterized. Here we have attempted to classify and characterize the phenotypic variability of the indigenous Tripura state buffalo population using cytogenetic tools.

The state Tripura gets its name from the Hindu goddess of beauty ‘Tripura Sundari’, temple at Udaipur in Tripura. Tripura is one of the oldest kingdoms now in the relic, it finds mention in the Mahabharata, ancient religious texts, the Puranas; and the Edicts of Ashoka dating from the third century BCE (Tripura.org.in). Tripura is a land-locked state with hilly terrain running from the northwest to the southeast direction, with alternating narrow valleys. ‘Bhangor’ buffalo is also known as “Manipuri” by local people. The indigenous people of Tripura are tribal settled in due course from different areas during the early British era to evade prosecution.

The swamp buffalo first domesticated in the Indochina region around the lower Yangtze region in China Sun *et al.* (2019) and dispersed to South-east Asia, China and India. North-eastern states of India form the continuous land link with East Asian countries which is the home of swamp buffaloes. Morphologically, swamp buffaloes are small in size and tend to wallow in water Borghese *et al.* (2005). The present study aimed at assessing the status of the Bhangor buffalo population from Tripura employing cytogenetic studies. So far buffaloes of the north-eastern states of India have been studied except for Tripura and are generally considered to be of swamp type based on their phenotypic resemblance to swamp type buffaloes. Recently Karan veer Singh *et al.* (2020) has shown the existence of swamp buffalo in Meghalaya state.

Distribution and Population

The physiography of the state is characterized by hills. The state has five anticlinal ranges of hills running north to the south, the intervening synclines are the Agartala–Udaipur, Khowai–Teliamura, Kamalpur–Ambasa, Kailasahar–Manu, and Dharmanagar–Kanchanpur valleys. Buffaloes are distributed in the hills as well as valley/plain regions of different parts of the state. With nine important rivers, there is over 400 wetlands, ponds, and swamps most of which are waterlogged seasonal which provide a natural habitat for buffaloes to wallow (Wetlands of Tripura, 1997). The total buffalo population of Tripura is estimated at around 7000 (20th Livestock Census, 2019), 50% of which is found in the Unakoti district alone, followed by the North-Tripura and Dhalai districts. The animal population is decreasing over the years due to mechanization of agriculture work, change in crop cultivation pattern, and destruction of natural grazing lands (Figure 1 & 2).



Figure 1: Typical habitat of ‘Bhangor’ buffalo in its native tract



Figure 2: Typical features of ‘Bhangor’ buffalo in its native tract

Physical Traits

Bhangor buffaloes are medium-sized animals with compact strong legs. The buffaloes are generally grey to greyish-

black in colour, with brown hairs. Albino animals (light pink colour) are also very common. The horn is sickle-shaped (curved) with a flat broad base and mostly corrugated. The average horn length is 60cm in adult animals. The ear is moderate in length (22 cm), which is horizontally placed having hairs on inner and outer margins. The forehead is mostly convex. Muzzle with typical white markings on either side. Typical white or greyish-white colour is observed between hoofs to the knee just like socks. The tail reaches up to the hock having a black tail switch. The udder is small, and milk veins were not prominent with small teats. The naval flap was almost absent. Young animals have prominent white stripes, one in the neck and another slightly above the brisket, represent another typical feature of the buffaloes, which fades in adult animals. The temperament of animals was active and aggressive (Figure 3 & 4).



Figure 3: 'Bhangor' buffalo Female



Figure 4: 'Bhangor' buffalo male

Management Practices

The buffaloes are reared traditionally in an extensively managed system under zero input conditions. These buffaloes are exclusively maintained on grazing in the wetlands of lakes, ponds, and forest areas which provide a source of livelihood to the owners. Management of the buffaloes is under zero cost of supplementation, shelter, and medication. Natural breeding is performed with the indigenous bulls. During the paddy cultivation season (May to July) the buffaloes are used for ploughing the fields. Field shelters with wood and thatched roof, open on two or three sides is common. Animal houses with brick walls and tin shade were also seen. Mostly these are constructed separately from the residence of farmers with no drainage system.

Utility

Buffaloes are primarily reared for draught power and sale of young male calves. The buffalo have proven to be very strong and efficient in agriculture work. Milking is not done though milk yield varies between 1.5 to 2.5 litres per day. The older animals and younger males are often sold, these animals are often sacrificed for religious purpose.

Cytogenetic Characteristics of Bhangor Buffaloes

The animals have distinctive karyotypic features established for swamp type buffaloes. Samples of the animals exhibited a diploid count of $2N=48$ chromosomes, which is typical for swamp buffalo features Bongso *et al.* (1984) and Sat (1987). The karyotype comprised of 23 pairs of autosomes and a pair of sex chromosomes. The 23 pairs of autosomes contain 5 biarmed (metacentric/submetacentric) and 18 acrocentric chromosomes. The distinguishing size feature of the fourth pair of metacentric chromosomes in swamp buffaloes results from the tandem fusion of chromosomes number 4 (4p) and 9 of riverine type DiBerardino and Iannuzzi (1981), Chowdhary *et al.* (1989). Cytogenetic analyses thus confirmed the swamp status of Bhangor buffaloes of north-east India.

Analysis of Mitochondrial DNA D-Loop Sequence Variation

Sequence analysis of mtDNA D-loop region of the sampled animals revealed distinct haplotypes. None of the

'Bhangor' haplotypes overlapped with the other established buffalo breeds, indicating distinct haplotypic structure of each population. The phylogenetic analysis of mtDNA D-loop region with other buffalo population samples clustered all 'Bhangor' buffalo haplotypes in one clade with 100% bootstrap value. The buffaloes were grouped along with the haplotypes reported from Manipuri and Chilika swamp buffaloes from India and the Chinese and Carabao haplotypes reported from abroad. Interestingly the sampled buffalo haplotypes investigated in this study clustered into the reported swamp lineages (Figure 5).

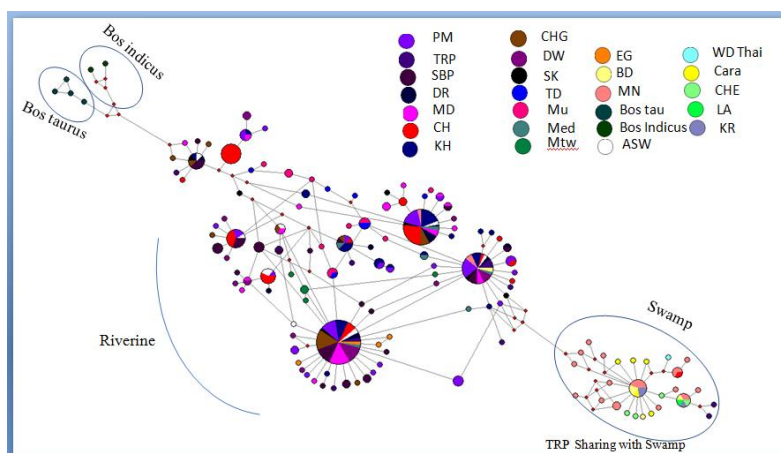


Figure 5: Mt D-loop haplotype-based network analysis in 24 populations along with *Bos taurus* and *Bos indicus*

Conclusion

It may be concluded that the indigenous buffalo showed uniformity in physical and morphometric traits and contributes significantly in the economy of the state. Management 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 in through genetic improvement programs. We are also recommending it to be register as new swamp breed population from Tripura, so as to give recognition.

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Conflict of Interests

There is no conflict of interest.

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