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Identification and characterization of Chhattisgarhi buffalo population in India

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ABSTRACT

Chhattisgarhi buffalo are raised in North and Central parts of Chhattisgarh. They are medium sized buffaloes having triple purpose utility viz. milk, drought and manure, which makes them economical to their keepers. Average milk production in buffaloes was around 4 kg/day with a peak milk yield of 6 kg and buffalo bullocks were preferred over cattle bullocks for cultivating rice fields. Physical and phenotypic characterization of Chhattisgarhi buffalo reveals that the population does not resemble other extant breeds of the region and has a unique management system, therefore, we may conclude that Chhattisgarhi buffalo is unique and distinct population. We recommend that Chhattisgarhi buffalo should be registered and recognized as separate breed of buffalo in India.

Key words: Chhattisgarhi buffalo, Biometry, Management, Phenotypic characterization, Utility

Buffalo has originated in India and is the key dairy animal in South Asia. The best breeds of dairy buffaloes are available in Indian subcontinent. Although *Bubalus bubalis* is widely distributed in Asia, but it has also been introduced to Europe, Near East, China, South America, the former Soviet Union and the Caribbean. Over half (56.53%) the world's buffalo population is in India which is approximately 108 million animals. As per 19th census, 21.23% of the livestock population are buffaloes (DAHD&F 2012). Buffalo in India are third major contributors in the livestock population and largest producer of milk (51% of total milk) in the country with a number almost half of the cattle. Further, the buffalo milk has at least 1.5 times more fat than indigenous cattle and almost two times than crossbred cattle. In addition to milk, the buffaloes have important contribution to milk, meat, draught animal power (DAP), skin, and edible and non-edible offal's (Vohra and Chakravarty 2011).

At present, there are 13 buffalo breeds which have been characterized and registered by ICAR-National Bureau of Animal Genetic Resources (NBAGR 2013). Murrah buffalo is the predominant buffalo breed in our country followed by Surti, Mehsana and Jaffarabadi. Toda and Bhadawari breed are threatened breeds of buffaloes. Besides these well-known breeds, there exists some less known buffalo populations in our country namely, Gojri (Vohra *et al*. 2012), South Kanara, Godavari, Burgur, Gangli, Jowari and Tarai buffalo. These lesser known populations are having their utility and an economic importance to resource poor farmers and helps in supporting their livelihood. Moreover, such populations are generally better adapted to a local region of their origin when compared to exotic and crossbred dairy animals. Still about 43% of total buffalo population (excluding purebred and their grades) of India is non-descript and has not been characterized, so far. Therefore, it is imperative to characterize non-descript buffalo genetic resource of Chhattisgarh state, describe its breeding tract, and identify their unique features and utility, as limited information is available regarding different buffalo population from Chhattisgarh state.

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MATERIALS AND METHODS

Native tract and climatic conditions: Survey revealed that breeding tract of Chhattisgarhi buffaloes include Kawardha, Korba, Sarguja, Balrampur, Jashpur, Bilaspur, Pendra, Mahasumund, Kawardha, Bemetra, Dhamtari and Kanker blocks of Chhattisgarh state (Fig. 1), which is distributed between 23.1355° N to 20.1990° N Latitude and 83.1818° E to 81.0755° E Longitude, has a uniform and distinct buffalo population. Their exact numbers is still not known. However, buffaloes in Chhattisgarh constitute 14.5% of the total livestock in the state. Murrah and Nagpuri buffalo (DAHD&F 2013) are the only known and registered breed of buffalo which is available in the state. About 93.67% of buffaloes in the state are non-descript which may comprise of Chhattisgarhi or desi buffaloes along with grades of extant breeds. The northern parts of the state are hilly, while the central part is a fertile plain. This area has extensive rice cultivation. The climate of Chhattisgarh is tropical. It is hot and humid because of its proximity to the Tropic of Cancer and its dependence on the monsoon for rains. Summer temperatures in Chhattisgarh can reach 45°C (113 °F). The monsoon season is from late June to October

Fig. 1. Breeding tract of Chhattisgarhi Buffalo.

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and the region receives an average of 1,292 millimetres (50.9 in) of rain. Winter is from November to January. Forests occupy 41.33% of the total area and the rich forest resources include wood, tendu leaves, honey and lac. Buffaloes in the state are maintained on grazing and occasionally a little feed is given. During rice cultivation period, the buffalo herds are generally shifted to forests and its nearby areas. Yadav's and Tribal communities like Gondh are primarily responsible for maintaining and rearing these buffaloes, as this valuable germplasm plays a major role in securing their livelihood. Based on the information collected through survey, it was revealed that majority of the livestock keepers rearing these buffaloes (68%) were illiterate and landless, however, few especially Yadav's, possess land in few acres along with buffaloes.

Animal material: Phenotypic characterization is used to identify and document diversity within and between distinct breeds/populations of a species. Therefore, keeping in view the guideline of the FAO (2012), a pilot study was conducted in 61 households of 45 villages from North and Central parts of Chhattisgarh state (Fig. 1). A total of 234 animals (157 adult females and 77 adult males) were studied.

Body measurements: Physical characteristics like coat colour, ear and horn orientation, colour of eye, muzzle and hoof etc. were recorded. Data consisted of 18 different body measurements which can explain the morphology of these buffaloes were taken. The biometric traits included in the study were height at withers (BH); body length (BL); leg length (LEG); neck length (NL); neck circumference (NC); chest girth (CG); paunch girth (PG); face length (FL); face width (FW); horn length (HL); horn circumference (HC); distance between horn (DBH); ear length (EL); distance between hip bone (HB); distance between pin bone (PB); distance between hip and pin bone (DBHP); tail length (TL); tail length up to switch (TUS). To avoid effect of age, only adult Chhattisgarhi buffaloes (3.5 y and above) were taken in the study. All the measurements were recorded once in upright animal standing on a level ground and by the same technical person to avoid between-recorder effects.

Statistical analysis: Measurements were recorded by using tape measure. All the analysis was carried out using the SPSS (2001).

RESULTS AND DISCUSSION

Physical characteristics: About 80% of these buffaloes were having black coat colour and their body had brown hairs. Legs though black in colour, but in about 20% animals studied had brown extremities. Hooves were greyish black whereas eyelids and muzzle were black in colour. Tail switch varied in appearance and was white (10%), brown (30%) and black (60%) of the animals studied. Ears had horizontal orientation. There was prominent dorsal ridge in both the sexes. The udder in females was small and round shaped with cylindrical teats (85%). Milk vein was prominent in 38% females. Horns were medium to large in size, going first laterally backwards and then pointing upwards in orientation (Figs. 2,3).

Body measurements: Biometrical records on 18 traits recorded in adult Chhattisgarhi buffaloes are shown in Table 1. In Nilli Ravi breed of river buffalo, Nivsarkar *et al.* (2000)

Figs. 2–3. **2.** Adult Chhattisgarhi female; **3.** Adult Chhattisgarhi male.

reported average BH, CG and BL as 134.2, 207.7 and 165.4 cm, respectively, whereas Ahmad *et al*. (2013) reported BH to be 140.2 cm in Nilli Ravi females. The BH, BL and CG in Chhattisgarhi buffaloes were less than the Gojri buffaloes, a lesser known buffalo population from North India (Vohra *et al.* 2015) and had 128.66 cm BH, 133.33 cm BL, 195.91 cm CG. In Kalahandi females, the average BH, BL and CG were reported 123.77, 122.16 and 172.11 cm, respectively (Dash *et al*. 2009). Based on comparison of body measurements traits like average height, BL and CG of Chhattisgarhi buffaloes with Nilli Ravi, Gojri and Kalahandi buffaloes, which are extant breeds of buffaloes; it can be concluded that Chhattisgarhi buffalo is lighter, smaller and medium sized buffalo. Variance for different body measurements traits in Chhattisgarhi buffaloes ranged from 1.14% (DBH) to 86.42% (NC) in males and 1.02% (FW) to 92.19% (HL) in females. It was observed that Leg, FL,

Table 1. Mean ± SE error along with variance of different body measurements traits (cm) studied in adult males and females Chhattisgarhi buffaloes

Trait	Adult male (n=77)					Adult female (n=157)				
	Min.	Max.	Mean	S.E.	C.V.	Min.	Max.	Mean	S.E.	C.V.
BH	121	131	126.15	0.415	8.255	115	138	123.48	0.397	18.129
LEG	78	88	82.17	0.301	4.896	72	85	79.94	0.249	6.670
NL	32	60	47.88	0.869	43.827	36	73	45.81	0.724	60.226
NC	55	101	80.00	1.221	86.421	56	91	73.63	0.685	53.991
BL	118	132	123.70	0.586	15.772	109	133	120.57	0.499	28.599
CG	170	195	179.88	0.955	47.437	163	188	176.51	0.685	40.765
PG	174	202	189.94	1.235	79.35	176	212	193.60	0.824	70.593
FL	39	50	44.59	0.310	5.374	40	49	43.73	0.163	3.041
FW	16	22	19.27	0.172	1.654	16	21	18.28	0.095	1.027
EL	18	28	25.57	0.330	6.320	21	28	25.37	0.127	1.850
HL	30	65	46.37	1.297	87.491	19	75	51.06	0.895	92.198
HC	17	29	22.84	0.409	9.712	15	21	18.11	0.132	2.013
DBH	13	17	15.44	0.142	1.143	13	21	15.57	0.115	1.527
HB	40	50	46.09	0.373	8.080	39	53	46.62	0.246	6.958
PB	14	21	17.31	0.265	3.580	14	25	18.89	0.226	5.891
DBHP	35	41	38.44	0.232	2.954	31	43	38.50	0.191	4.182
TL	80	106	92.41	1.003	54.321	73	112	94.15	0.856	82.148
TUS	67	92	81.52	0.870	42.400	68	98	83.39	0.680	53.223

BH, height at withers; BL, body length; LEG, leg length; NL, neck length; NC, neck circumference; CG, chest girth; PG, paunch girth; FL, face length; FW, face width; HL, horn length; HC, horn circumference; DBH, distance between horn; EL, ear length; HB, distance between hip bone; PB, distance between pin bone; DBHP, distance between hip and pin bone; TL, tail length; TUS, tail length up to switch; n, number of adult animals; S.E., standard error; C.V., coefficient of variation.

FW, EL, HC, DBH, HB, PB and DBHP showed higher consistency and less variance compared to NL, NC, CG, PG and TL which had shown more variability. This may be due to the fact that in latter either selection was not applied for these traits or these parts respond more to the environment than others. Face length had little variability which may be due to the fact that it is a cephalic measurement and its close association with cranial bone. Majority of body measurements showed less variability, indicating that the Chhattisgarhi buffaloes are almost uniform in their body size.

Management and utility: Chhattisgarhi buffaloes are reared on extensive management with low input system. Male is raised and reared along with the females in a single herd without any special management. Weaning is not practised in calves. Buffaloes are kept in closed *pucca* house with temporary roof as a separate part of residence only during night, whereas tied in open under shade/cover during day time. Although buffaloes are housed separately but no adequate space is provided to each animal. Poor drainage was observed in animal houses. All the young calves born in a herd are kept under closed *pucca* house, so as to protect them from predators. It was observed that during paddy sowing season, these buffaloes generally migrate to forest or its nearby areas, where they are kept in pooled large herds called "*Bathaan*" (Fig. 4). This system of management reduces risk, lead to sharing of resources and better management of labour and reduces cost of rearing. Buffaloes were reported to be vaccinated in majority households against diseases like Haemorrhagic septicaemia (HS), Black quarter (BQ) and Foot and mouth diseases (FMD), deworming is not practiced.

Fig. 4. *Bathaan* system of animal housing.

The utility of Chhattisgarhi buffaloes is for milk, draught power and to some extent manure also. Females are moderate milkers and are milked twice daily. According to the livestock keepers of the region, buffalo bullocks are favoured over cattle bullocks in ploughing rice fields as they work better under rainy weather and in water filled fields. The buffalo bullock pair may fetch as much as ₹ 25,000 to 40,000/pair and sometimes during high demand in paddy sowing season, these bullocks are even rented @ ₹ 200/day. Declining grazing land and fast declining water bodies in the region were identified as their major problem, followed by lack of adequate health cover and financial support to given to these buffalo keepers.

Dairy and reproductive performance: Based on test day

Table 2. Average milk constituents in Chhattisgarhi buffalo and variance analysis

Parameter	First lactation (n=10)				Average pooled lactation (n=55)			
	Fat	Protein	Lactose	SNF	Fat	Protein	Lactose	SNF
Mean	6.123	3.291	4.842	8.102	7.112	3.911	5.567	9.491
Std. Dev.	1.626	0.551	0.943	1.741	1.741	0.809	1.188	2.072
Minimum	3.56	2.47	3.48	5.79	3.56	2.06	3.18	5.55
Maximum	9.42	4.02	6.26	10.85	11.08	6.50	8.27	13.97
Coefficient of variation	2.645	0.304	0.889	3.030	3.030	0.655	1.412	4.293

Source	Dependent variable	Type III Sum of Squares	Mean square	F	P-value
Lactation number	Fat	11.933	11.933	4.170	0.046
	Protein	4.702	4.702	8.132	0.006
	Lactose	6.416	6.416	4.871	0.032
	SNF	39.114	39.114	10.758	0.002

milk recording and the information generated through predesigned survey questionnaire, it was concluded that an average milk production in Chhattisgarhi buffaloes is around 4 kg/day with a peak milk yield of 6 kg. The average daily milk yield in Chhattisgarhi buffalo is higher than Kalahandi and Bhadawari buffaloes and is comparable to Marathwadi buffalo. The lactation length ranges from 7 to 12 months. The average milk constituents estimated in random milk samples (n=55) and were grouped in to first lactation and average pooled lactation (Table 2). Average milk fat percentage in Chhattisgarhi buffalo was found to be around 7%, which is comparable to average milk fat per cent in Murrah and other extant breeds of buffalo, like Kalahandi, available nearby. The average fat (%), protein (%), lactose (%) and SNF percent were significantly less ($P<0.05$) in first lactation as compared to subsequent pooled lactation. The age at first calving in females was higher and vary between 5 to 6 y. Whereas the average age at first service was reported to range between 3–4 y in males.

In conclusion, phenotypic characterization suggests that Chhattisgarhi buffalo is a distinct buffalo population from North and Central Chhattisgarh. These buffaloes have unique *Bathaan* system of management. Detailed studies are needed for its complete characterization and genetic comparison with other breeds of the region. We recommend that Chhattisgarhi buffalo should be registered and recognized as separate breed of buffalo in India, so that systematic breeding plan could be designed for their genetic improvement.

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