

PHENOTYPIC CHARACTERISTICS OF SAMBALPURI BUFFALOES OF INDIA

S. Sahu, G.D. Nayak* and D.K. Karna**ABSTRACT**

Sambalpuri buffalo is one of the lesser known breeds of India. Phenotypic information on conformation, production and reproduction traits at farmers' level was collected through a questionnaire. A total of 198 adult animals (67 male, 131 female) were measured from eleven villages of its native tract. These data were subjected to least squares analysis and Duncan's multiple range test. The overall least square means for body length, heart girth, height at withers, paunch girth, head length, horn length, tail length, body weight were found to be 132.54±0.72 cm, 177.90±0.71 cm, 125.50±0.46 cm, 189.06±0.82 cm, 50.73±0.36 cm, 55.29±0.55 cm, 81.33±0.90 cm and 411.47±5.34 kg respectively. The overall least square means for age at first calving, calving interval, gestation period, average daily milk yield, lactation length, dry period and lactation yield were 1488.42±3.24 days, 533.92±2.12 days, 314.19±0.55 days, 2.95±0.08 litres, 282.26±2.69 days, 251.15±3.46 days and 809.57±18.75 litres respectively. Horn length difference was found to be significant ($P<0.01$) among localities but, between sex it was non-significant. All other conformation traits were found to be non-significant among localities. However, there exists a significant difference

between two sexes ($P<0.01$) in relation to all conformation traits except horn length and tail length. The effect of localities were significant ($P<0.01$) on all the production and reproduction traits except for gestation period.

Keywords: Sambalpuri buffalo, conformation trait, production reproduction traits, adult weight

INTRODUCTION

Indian buffaloes account for 57.3% of world buffalo population. Buffaloes contribute to 51.2% of total milk production in India (Bhat, 2010). Again the recognised breeds constitute only 35% of total buffaloes. The rest are either nondescript or upgraded ones. In India, there are 13 recognised breeds of buffaloes found countrywide. Apart from these, there are other potential local buffalo populations which are classified under lesser known breeds by National Bureau of Animal Genetic Resources, Karnal, India. Sambalpuri buffalo is one among them, which exist in pure form in certain pockets of undivided Sambalpur district of Odisha state which harbours 1.06 millions of buffaloes out of the 108.07 millions of buffaloes in India as per the 19th Livestock census of India

(2012). It bears a distinct phenotypic identity and contributes significantly to milk production as well as farm power in its native tract.

Growth rate, body weights and economic traits vary substantially in different buffalo populations. Nagercenkar (1978) has also emphasized the need for a systemic approach for exploiting profitability from buffalo through additional information in shape of growth in males and females, genetic difference for mature size and productivity of different breeds. However, before taking any meaningful breeding improvement and conservation programme in any animal species, it is necessary to know the present status of the animal. For, conservation of Sambalpuri buffaloes in its native tract, the present study has been undertaken with an objective to generate phenotypic information on conformation traits, production and reproduction traits at farmers' herd.

MATERIALS AND METHODS

Data were collected by personal interaction



Figure 1. Herd of Sambalpuri buffaloes grazing in natural habitat.

with owners as per a modified questionnaire of FAO (2012). Every care was taken to select a village where artificial insemination was not practised. Eleven villages were identified from the native tract of Sambalpuri buffalo population. A total of 198 (67 males and 131 females) buffaloes produced from eleven sires were measured for weight and morphometric traits viz. body length, heart girth, height at withers, paunch girth, head length, horn length and tail length. In most of the villages, buffaloes were reared in extensive system without any feed supplementation. The animals measured were from the age of two to five years. The animals were medium in size and coat colour was black with black or brown hair (Figure 1 and Figure 2). The head was wedge shaped with a distinct white patch on forehead in some animals. Horns were sickle shaped and the animal possessed droopy ear with tail reaching down to hock joint ending with black or white switches.

Body length (point of shoulder to point of pin bone), heart girth, height at withers, paunch girth, head length, horn length and tail length were measured with the help of a measuring tape.



Figure 2. Body measurements in adult animals.

Body weight was calculated using the Shaeffer's formula ($L * G^2 / 300$) as described by Sastry *et al.* (1983) where, L and G were length and girth in inches and body weight in pounds. Later weights were converted to kilogram multiplying with an appropriate factor and the morphometric traits were reported in cm. The recorded production and reproduction traits were age at first calving, calving interval, gestation period, daily milk yield, lactation length, dry period and lactation yield.

The data on buffalo population were collected from eleven villages selected from 3 blocks. The significance of difference between blocks (localities) and sexes with respect to different conformation traits were studied using least squares analysis (Harvey, 1990). The statistical model used for calculation of least squares means and standard error of conformation traits was

$$Y_{ijk} = \mu + L_i + S_j + e_{ijk}$$

where, $i=1,2$ and 3 (localities); $J = 1$ and 2 (sexes)

Y_{ijk} = measurement of k^{th} animal of i^{th} locality and j^{th} sex

Where, μ = overall mean, L_i = effect of i^{th} locality,

S_j = effect of j^{th} sex,

e_{ijk} = error associated with k^{th} animal of j^{th} sex in i^{th} locality

Similarly, the statistical model used for calculation of least squares means and standard errors for reproduction and production traits was,

$$Y_{ijk} = \mu + L_i + e_{ij}$$

where, Y_{ijk} = measurement of j^{th} animal of i^{th} locality.

Where, μ = overall mean, L_i = effect of i^{th} locality, e_{ij} = error associated with j^{th} animal of i^{th} locality. Also the comparison between means were made using Duncan's multiple range test (Kramer, 1957)

RESULTS AND DISCUSSION

The least squares means and standard errors of conformation traits as well as production reproduction traits of male and female Sambalpuri buffalo population in different localities are presented in Table 1. The overall least square means for body length, heart girth, height at withers, paunch girth, head length, horn length, tail length, body weight were found to be 132.54 ± 0.72 cm, 177.90 ± 0.71 cm, 125.50 ± 0.46 cm, 189.06 ± 0.82 cm, 50.73 ± 0.36 cm, 55.29 ± 0.55 cm, 81.41 ± 0.79 cm and 411.47 ± 5.34 kg respectively. Patro *et al.* (2003) reported the mean body length, girth, height at withers and weight were 122.3 ± 0.2 cm, 169.7 ± 0.3 cm, 123.9 ± 2.7 cm and 320.0 ± 0.7 kg, respectively in Chilika buffaloes which was lower than the body measurements of the Sambalpuri buffaloes. Similar conformation traits were reported in for the swamp buffaloes of Assam at 3 to 4 years of age by Kalita *et al.* (2010) and by Tayade *et al.* (2011) in Gaolao strain of Nagpuri buffaloes.

The least square analysis of variance of the morphometric traits (Table 2) revealed that localities had a significant effect on horn length but all other conformation traits were found to be non-significant among localities. This could be viewed for uniqueness of the population. However, there existed significant differences between two sexes ($P < 0.01$) in relation to all conformation traits where males had higher measurements than the females except for horn length and tail length. The present finding also agree with the findings of Dash (2002) in Kalahandi buffaloes. Horn length and tail length are less influenced by sex hormones (Frandsen, 1981) and hence is unique for all Sambalpuri buffalo population irrespective of sex. The overall least squares mean of age at first calving, average daily milk yield, Lactation yield, Lactation length

Table 1. Least square means with standard error for conformation, production and reproduction traits of adult Sambalpuri buffaloes.

Sl. No.	Traits	Locality			Sex		Overall (N=198)
		Barkote (N=53)	Bargarh (N=59)	Bhatli (N=86)	Male (N=67)	Female (N=131)	
1	Body length (cm)	132.73 ±1.31 ^a	132.28 ±1.31 ^a	132.59 ±1.01 ^a	136.31 ±1.18 ^c	128.76 ±0.86 ^d	132.54 ±0.72
2	Heart girth (cm)	178.71 ±1.28 ^a	177.54 ±1.24 ^a	177.44 ±0.99 ^a	181.68 ±1.55 ^c	174.11 ±0.80 ^d	177.90 ±0.71
3.	Height at withers (cm)	125.36 ±0.84 ^a	126.05 ±0.81 ^a	125.10 ±0.65 ^a	127.93 ±0.75 ^c	123.07 ±0.52 ^d	125.50 ±0.46
4	Paunch girth (cm)	188.14 ±1.48 ^a	188.82 ±1.44 ^a	190.21 ±1.14 ^a	191.95 ±1.33 ^c	186.16 ±0.92 ^d	189.06 ±0.82
5	Head length (cm)	51.20 ±0.66 ^a	49.80 ±0.64 ^a	51.20 ±0.51 ^a	52.00 ±0.59 ^c	49.47 ±0.41 ^d	50.73 ±0.36
6	Horn length (cm)	56.64 ±1.00 ^a	56.25 ±0.97 ^a	53.00 ±0.27 ^b	55.54 ±0.90 ^c	55.05 ±0.62 ^c	55.29 ±0.55
7	Tail length (cm)	81.00 ±1.44 ^a	81.48 ±1.39 ^a	81.75 ±1.11 ^a	81.49 ±1.29 ^c	81.33 ±0.90 ^c	81.41 ±0.79
8	Body weight (kg)	418.66 ±9.70 ^a	406.80 ±9.40 ^a	408.94 ±7.47 ^a	440.33 ±8.71 ^c	382.60 ±6.05 ^d	411.47 ±5.34
9	Age at first calving (days)	1478.37 ±6.07 ^a	1504.26 ±5.50 ^b	1482.63 ±5.27 ^a	--	--	1488.42 ±3.24
10	Calving interval (days)	522.40 ±3.97 ^a	535.04 ±3.60 ^b	544.32 ±3.45 ^b	--	--	533.92 ±2.12
11	Gestation period (days)	314.05 ±1.03 ^a	315.60 ±0.94 ^a	312.93 ±0.90 ^a	--	--	314.19 ±0.55
12	Average daily milk yield (lt)	2.22 ±0.15 ^a	3.40 ±0.13 ^b	3.24 ±0.13 ^b	--	--	2.95 ±0.08
13	Lactation length (days)	300.86 ±5.03 ^a	270.46 ±4.56 ^b	275.46 ±4.37 ^b	--	--	282.26 ±2.69
14	Dry period (days)	221.54 ±6.47 ^a	264.57 ±5.86 ^b	267.34 ±5.62 ^b	--	--	251.15 ±3.46
15	Lactation yield (lt)	653.22 ±35.05 ^a	897.84 ±31.78 ^b	877.65 ±30.54 ^b	--	--	809.57 ±18.75

Values along a row within a group with same superscript do not differ significantly (P<0.05)

Table 2. Least square analysis of variance

Sl.No	Traits	F _L	F _S
1	Body length	0.034	27.766**
2	Heart girth	0.352	29.367**
3	Height at withers	0.435	28.476**
4	Paunch girth	0.683	12.815**
5	Head length	1.792	12.415**
6	Horn length	5.508**	0.199
7	Tail length	0.085	0.010
8	Body weight	0.474	30.042**
9	Age at first calving	6.104**	--
10	Calving interval	8.656**	--
11	Average daily milk yield	18.221**	--
12	Gestation period	2.094	--
13	Lactation length	11.227**	--
14	Dry period	16.998**	--
15	Lactation yield	16.108**	--

** P<0.01, F_L : F value for locality in ANOVA, F_S : F value for sex in ANOVA.

and calving interval were found to be 1488.42±3.24 days, 2.95±0.08 lts, 809.57±18.75 lts, 282.26±2.69 days and 533.92±2.12 days respectively in Sambalpuri buffaloes (Table 1). All the production and reproduction traits were significant (P<0.01) for locality differences except for gestation period. Production and reproduction traits of Sambalpuri buffalo population bear a similar value to that of draught breeds. Mahapatra (1993) found 49.0±0.07 months of age at first calving in Sambalpuri buffaloes in another study. Das (2002) observed age at first calving, calving interval, daily milk yield, lactation length, dry period and lactation yield in Kalahandi buffalo as 1528.05±7.40 days, 526.89±3.55 days, 12.64±0.07 lt, 297.7±0.95 day, 218.59±3.97 day and 813.12 lts. Patro *et al.* (2003) reported lower mean age at first calving (1331.4 vs 1488.4 days) and calving intervals (431.7 vs

533.9 days) in Chilika buffaloes in comparison to Sambalpuri buffaloes. However, the average daily milk yield, in Sambalpuri buffaloes in this study was found to be comparable to that of the Chilika buffaloes of Odisha as reported by Mishra (2001); Patro *et al.* (2003); Dash (2004). The present findings in conformation traits, production and reproduction traits place Sambalpuri buffalo population in between dairy breed and draught breed. As per NBAGR (2010), lower values for the conformation traits were found in Chilika Buffaloes (122.72±0.26 cm), a draught breed and higher values were found in Surti buffalo (153 cm) a dairy breed or in Murrah as reported by Yadav *et al.* (2007). The habitat of Sambalpuri buffalo is nearer to Chhatisgarh and Jharkhand which contain a sizeable population of dairy buffaloes. Over centuries some of them might have migrated

to the native tract of Sambalpuri population. Cross breeding with local draught breeds and then natural selection process might have caused the present status. Moreover, Bhat (2010) also reported that heart girth to be more than 190 cm in males and more than 184 cm in females in order to include that individual under dairy category.

It is a fact that dairy animals come to heat earlier, their calving interval is less, milk yield more, lactation length more and dry period is less. This might be due to the fact that, farmers provide a better balanced feed to dairy animals. In addition to the genetic effects, environment also plays an important role in those traits. But, farmers do not provide any kind of balanced feed to Sambalpuri buffalo population as they are used as draught animals. Due to draught pressure even on female buffaloes, the dairy traits perhaps suffer a lot. Hence, the values of dairy traits are more close to that of draught breeds of Odisha. Again, analysis of variance for reproduction traits (Table 2) shows that a significant difference exists between localities. But, gestation period do not show any kind of variation because, it is constant for a species. The difference in other production and reproduction traits might be due to difference in management practices followed in different region and hence may be purely environmental.

Sambalpuri buffalo is a lesser known buffalo population found in Odisha, India. Direct selection on age at first calving, calving interval, average daily milk yield, lactation length, dry period and lactation yield and indirect selection on heart girth, paunch girth, body length can improve dairy characters in Sambalpuri buffalo population in order to establish itself as a dual purpose breed.

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