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On-field sporting traits and behaviour of indigenous cattle breeds in sporting events (*jallikattu*) of Tamil Nadu

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ABSTRACT

The on-field sporting traits and behaviours in bull baiting (*jallikattu*) were recorded in 857 sporting bulls in Madurai and Trichy districts. The overall mean velocity, stride length, time spent within the boundary of fighters and time taken to get tamed of the sporting bulls were 11.77±0.17 m/s, 7.07±0.09 m, 12.76±0.51 sec and 4.90±0.22 sec respectively. Overall on-field sporting behaviours like laterality, hooking, jumping, kicking and agonistic behaviour were 30%, 16.8%, 24.9%, 15.3% and 10.50% respectively. The event of winning and losing, and place of event had highly significant effects on velocity of sporting bulls. Place of event was found to affect the stride length significantly. There was a highly significant effect on laterality, hooking and agonistic behaviour among the winning and losing bulls. Presence or absence of hooking behaviour had highly significant effect and it was more prominent in winning (19.3%) than in losing (11%) bulls.

Key words: Indigenous bulls, *Jallikattu,* Sporting behaviour, Sporting traits

In world, livestock biodiversity is a result of domestication process for various purposes such as companionship, draught power, food security, sporting and cultural association. Of which, certain livestock breeds become inseparable from human-folk because of its cultural or recreational companionship from time-immemorial. One such popular sporting event in Southern India, especially in Tamil Nadu, is 'Bull Baiting', in local vernacular language (Tamil) termed as '*jallikattu*' in which native indigenous cattle breeds used. Documentation of sporting events of cattle and their cultural association with the folk, have been carried out extensively by the anthropologists, scholars of ancient Tamil and animal lovers. However, scientific investigation to elucidate the rationale behind these event connected with specific sporting traits have not been attempted so far. Hence the present study was undertaken to evaluate the on-field sporting traits and behaviours of sporting bulls of indigenous cattle breeds in *jallikattu*.

MATERIALS AND METHODS

The study was conducted in Madurai and Trichy districts. The total number of sporting events covered was 11; out of these 3 events were from Madurai (famous sporting events such as Allanganallur, Avaninapuram and Palamedu), 8 events from Trichy district. Video footage of the sporting event was done personally as well collected from authorized videographers and from the owners. Sporting bulls (857) of Pulikulam, Kangayam, Umblachery and non-descript bulls were assessed for on-field sporting traits such as velocity, stride length, time spent within the boundary of bull tamers and time taken to get tamed.

Speed: It was measured by time (in sec) taken to travel a distance of 50 metre by the sporting bulls.

Stride length: It was measured by counting the number of strides taken to cover a 50 metre distance.

Laterality: Laterality or handedness was a preferential usage of one side of the body over the other. It dealt with on which side (either left or right) the bull turned often to shield itself from bull tamers.

Hooking behaviour: It indicated the aggressive behaviour of the bull in the event expressed by hooking of tamers with their horns in the *jallikattu* area.

Time spent within the boundary amid bull tamers: It was assessed by measuring the time spent (in sec) by the bull (not restrained by the bull tamers) within the arena. It indicates confrontational or pugnacious behaviour of the sporting bull.

Time taken to get tamed: It was assessed by measuring the time taken (in sec) by the bull to get tamed by the any one of the bull tamers within the arena.

Winning / Losing: The winning or losing of sporting bulls were judged by 3 indicators. The participants were allowed to embrace the hump and riding beside the bull for 15 m or for 30 sec or to hang on with hump for up to 3 jumps of the

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bull within the prescribed distance and were considered as winners in this event and those bulls were the losers. If the bulls which were not restrained by above said conditions, were considered as winners.

The on-field sporting behaviours such as laterality, hooking, jumping, kicking and agonistic were assessed on sporting bulls through video graphic images obtained from organizers of the sporting event.

Statistical analysis: The data were analyzed to study the effect of different factors such as place of event (1, Madurai; 2, Trichy), genetic groups (1, Pulikulam; 2, Kangayam; 3, Umblachery; 4, Non-descript bulls) and event of winning / losing by the least-squares analysis of variance and chi-square test of significance to assess the significance (SPSS version 20). The Duncan's Multiple Range Test as modified by Kramer (1957) was employed to make pairwise comparisons of least-squares analysis of variance.

$$Y_{ij} = \mu + F_i + e_{ij}$$

where $Y_{ij,}$ the dependent variable or the sporting traits such as velocity, stride length, time spent within the boundary of bull tamers and time taken to get tamed; μ, overall mean; F_i, effect of place of event or different genetic groups or sporting ability; $e_{ij,}$ random error, normally and independently distributed with a mean of '0' and variance of $\sigma^2_{e.}$

RESULTS AND DISCUSSION

The least-squares mean and standard errors of on-field sporting traits are given in Table 1. This is first of its kind to assess the sporting traits in indigenous bulls in Tamil Nadu and the published scientific literatures pertaining to these traits are scarce in India.

On-field sporting traits

Velocity: In this study, overall mean velocity of the sporting bulls was 11.77±0.17 m/s. The mean velocity of Kangayam bull was 11.72±0.41 m/s in the sporting area, which is totally different from the speed of Kangayam bullocks found while carting (1.31 m/s) and ploughing (1.24 m/s) (Gogoi 2012, Sreekumar and Thomas 1990). The mean velocity of Umblachery bull was 12.39±0.59 m/s, which is higher than the mean speed of Umblachery bullocks during ploughing (0.95±0.03 m/s; Kousalya 2016).

In the present study, velocity of winning bull was faster than the losing bulls. It indicates that the sprinting ability through higher velocity made the bulls to escape from the bull tamers, uncaught. Among the genetic groups, Umblachery bulls had higher velocity, which might be due to smaller size and lesser body weight. In Paalamedu and Avaniapuram, the velocity of the bulls were higher, which could be attributed to the orientation of main sporting arena (straightened path) in both places, when compared to Alanganallur, where sporting arena was almost 'L' shaped, making them to run with little lower velocity, which was clearly evidenced in this study.

Stride length: The overall mean stride length was 7.07±0.09 m in this study. The average stride length of Kangayam bulls was 7.05±0.14 m, which is incomparable with the normal draught capacity of these bulls as reported by Kumaravelu (1995) and Gogoi (2012) for Kangayam bullocks on ploughing (0.88 m) and carting (0.77 m) respectively. The mean stride length of the Umblachery bulls was 7.45±0.28 m, however, lower stride length value was reported by Kousalya (2016) in Umblachery bullocks during ploughing (1.20±0.02 m).

Velocity and stride length of bulls are in positive correlation as it was evident from this study. This positive correlation between velocity and stride length were well pronounced in winning bulls irrespective of breed, Umblachery bulls (having higher mean value) and place of

Table 1. Least-squares means (Mean±SE) for on-field sporting traits

Effect	On-field sporting traits			
	Velocity (m/s)	Stride length (m)	Time spent within the boundary (sec)	Time taken to get tamed (sec)
Overall	11.77±0.17 (654)	7.07±0.09 (577)	12.76±0.51 (229)	4.90±0.22 (255)
Events	**	NS	NS	–
Win	12.45±0.19 (498)	7.16±0.06 (449)	12.38±0.83 (117)	–
Loss	9.63±0.29 (156)	6.73±0.36 (128)	13.14±0.60 (112)	–
Genetic group	NS	NS	**	**
Pulikulam	11.57±0.28 (222)	6.86±0.09 (194)	15.60^{a}±1.06 (90)	5.85^{a}±0.51 (94)
Kangayam	11.72±0.41(130)	7.05±0.14 (117)	10.34^{ab}±0.72 (58)	4.89^{ab}±0.44 (37)
Umblachery	12.39±0.59 (28)	7.45±0.28 (22)	8.50^{b}±1.56 (4)	3.60^{ab}±0.75 (5)
Non-descript	11.90±0.25 (274)	7.21±0.20 (244)	11.47^{ab}±0.57 (77)	4.20^{b}±0.21 (119)
Place of event	**	*	NS	**
Alanganallur	11.07^{c}±0.25 (236)	7.16^{b}±0.11 (193)	14.10±0.92 (90)	4.85^{bc}±0.28 (102)
Avaniapuram	12.08^{b}±0.37 (142)	7.53^{a}±0.13 (130)	11.36±0.89 (50)	5.30^{b}±0.56 (60)
Paalamedu	11.68^{bc}±0.34 (165)	7.63^{a}±0.12 (147)	11.57±0.93 (53)	3.75^{c}±0.27 (63)
Trichy	13.03^{a}±0.41 (111)	7.37^{ab}±0.11 (107)	13.08±1.35 (36)	6.67^{a}±1.02 (30)

**, Highly significant (P<0.01); *Significant (P<0.05) and NS, Nonsignificant. The least squares means with different superscripts differ significantly.

sporting events (Palamedu and Avaniapuram tracts having the uniform surface and straight path).

Time spent within the boundary of bull tamers: The average time spent within the boundary of fighters was 12.76±0.51 sec.

Pulikulam bulls had spent more time inside the boundary of fighters (15.60±1.06 sec), when compared to other genetic groups. Pulikulam bulls are entertaining the audience by its valour and vivacity in the sporting arena, hence, the breed was popularly considered as '*jallikattu*' breed from the ancient days. Winning bull spent more time within the boundary of bull tamers and it was considered as endurance power of the sporting bulls. With respect to Alanganallur, the time spent within the boundary of bull tamers was higher; it could be due to 'L' shaped orientation of sporting arena, in which bulls could not propel with ease to recognise the exit route in the sporting arena.

Time taken to get tamed: The mean time taken to get tamed was 4.90±0.22 sec. Among different genetic groups, Pulikulam bulls took more time to get tamed (5.85±0.51 sec) by the bull tamers and it has reflected the endurance power of Pulikulam bulls.

The present study is first of its kind in Tamil Nadu on sporting bulls, wherein sporting traits are assessed based on large number of sporting bulls in different genetic groups, place of event and winning and losing bulls.

On-field sporting behaviour: Incidence of on-field sporting behavior among winning and losing bulls; and among different genetic groups is given in Table 2 and 3 respectively.

Laterality: Only 30% of sporting bulls displayed this behaviour, out of which higher per cent was seen on left side (16.60%) followed by right side (11.20%) and symmetry (2.20%), which is compared with study on rodeo or bucking bulls performance by Romero (2008), who observed 62.20% bulls being towards left and 37.80% of

Table 2. Incidence of on-field sporting behaviour among winning and losing bulls

On-field sporting behaviour	Incidence	Winning bulls		Losing bulls		Overall		χ^2
		n	%	n	%	n	%	
Laterality	Absent	462	76.70	138	54.10	600	70.00	44.12**
	Left	75	12.50	67	26.30	142	16.60	
	Right	54	09.00	42	16.50	96	11.20	
	Symmetry	11	01.80	8	03.10	19	02.20	
Hooking	Present	116	19.30	28	11.00	144	16.80	8.80**
	Absent	486	80.70	227	89.00	713	83.20	
Jumping	Present	161	26.70	52	20.40	213	24.90	3.87*
	Absent	441	73.30	203	79.60	644	75.10	
Kicking	Present	105	17.40	26	10.20	131	15.30	7.26*
	Absent	497	82.60	229	89.80	726	84.70	
Agonistic behaviour	Playing	63	10.50	56	22.00	119	13.90	45.67**
	Running	539	89.50	189	74.10	728	84.90	
	Standing	0	0.00	10	03.90	10	01.20	

n, Number of observations; **, Highly significant (P<0.01); *, Significant (P<0.05).

Table 3. Incidence of on-field sporting behaviour (%) in different genetic groups of sporting bulls

On-field sporting behaviour	Incidence	Genetic group										χ^2
		Pulikulam		Kangayam		Umblachery		Non-descript		Overall		
		n	%	n	%	n	%	n	%	n	%	
Laterality	No	191	63.50	128	71.90	26	83.90	255	73.50	600	70.00	14.13NS
	Left	60	19.90	28	15.70	4	12.90	50	14.40	142	16.60	
	Right	39	13.00	19	10.70	1	03.20	37	10.70	96	11.20	
	Symmetry	11	03.70	3	01.70	0	0	5	01.40	19	02.20	
Hooking	Yes	77	25.60	31	17.40	3	09.70	33	09.50	144	16.80	30.97**
	No	224	74.40	147	82.60	28	90.30	314	90.50	713	83.20	
Jumping	Yes	76	25.20	52	29.20	10	32.30	75	21.60	213	24.90	4.70NS
	No	225	74.80	126	70.80	21	67.70	272	78.40	644	75.10	
Kicking	Yes	48	15.90	38	21.30	2	06.50	43	12.40	131	15.30	9.27*
	No	253	84.10	140	78.70	29	93.50	304	87.60	726	84.70	
Agonistic behaviour	Playing	51	16.90	31	17.40	2	06.50	35	10.10	119	13.90	14.17*
	Running	247	82.10	147	82.60	29	93.50	305	87.90	728	84.90	
	Standing	3	1.0	0	0.00	0	0.00	7	2.00	10	1.20	

n, Number of observations; **, Highly significant (P<0.01) ; *, Significant (P<0.05); NS, Nonsignificant.

bulls towards right side laterality. With respect to genetic groups, Pulikulam (36.50%) and non-descript bulls (26.50%) showed higher per cent of this behaviour in sporting arena when compared to other genetic groups.

Hooking: This behaviour was expressed only in 16.80% of sporting bulls in the sporting arena. The hooking behaviour had highly significant (P<0.01) effect on winning and losing. The exhibition of this behaviour was very minimal among the bulls and if a bull tosses its head with horns, creates panic among bull tamers and they become apprehensive of catching or taming the bull. This sort of behaviour was observed, if the bull tamer tried to restrain the bull in direct approach or if they assembled in gang in front of the entrance (*vaadivasal*). Among genetic groups, hooking behaviour was present in Pulikulam (25.60%) and Kangayam (17.40%) bulls when compared to other genetic groups.

Jumping: Sporting bulls jumped from the entrance about 8–10 feet height, thereby run away from the bull tamers in the sporting arena. Overall, about 24.90% of sporting bulls and winning bulls possessed higher per cent of this behaviour than the losing. The trained and experienced bulls consistently expressed this behaviour in the sporting arena. Among genetic groups, higher occurrence was observed in Umblachery (32.30%) and Kangayam bulls (29.20%), which could be due to smaller in size and younger age respectively.

Kicking: Only 15.30% of the sporting bulls exhibited this behaviour in the sporting arena. On comparison of winning and losing, winning bulls showed higher per cent of kicking behaviour. It is very common in sporting area, if the bull tamer tried to hold the sporting bull from its rear side or behind the hind legs. This behaviour was mostly observed in Kangayam (21.30%) followed by Pulikulam bulls (15.90%).

Agonistic behaviour: Majority of sporting bulls (84.90%) ran very fast and easily escaped from the bull tamers and won in the events. Bulls shown aggression towards bull tamers were very alert, turned around within the split seconds, quickly sensed the approach of the tamer and expressed their bravery in sporting arena, which were known as agonistic behaviour towards bull tamers and this type of endurance was highly observed in Kangayam (17.40%) and Pulikulam bulls (16.90%), in that order, though insignificant among the genetic groups. Sporting bulls usually possess various on-field sporting behaviour for which they are trained to tackle bull tamers. Among all these behaviour, hooking and agonistic are main determinants of aggression and winning.

In conclusion, this sporting event is an ancient and traditionally important event for livestock keepers and agrarian community to maintain genetic variability of aggressiveness among indigenous bulls, since aggressiveness is the genetic trait, partially controlled by additive gene action. This would help in directional selection and genetic improvement of native breeds with respect to draught power.

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