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Tharparkar: The pride of desert

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Abstract
Tharparkar is one of the most important milch breed of the western arid region of India, it has a distinct identity amongst all Indian cattle breeds, which can withstand harsh desert climatic conditions, and provide livelihood security to the millions of the rural farmers. It is an indispensable component of animal agriculture in arid region of India especially Rajasthan. It is popular among farmers as it produces an ample quantity of milk and supports agriculture farming through its drought power. In breeding tract, the Tharparkars are usually kept in herds of 50 to 300 animals by professional breeders called Maldars. When left on arid pasture the milk production is approximately 1135 kg per lactation, while those animals maintained in the villages average 1980 kg. Because of its peculiar features 'Tharparkar' has caught the attention of breeders in the country and has been extensively used in crossbreeding programs. Its crosses with various exotic breeds like Holstein Friesian and Brown Swiss has proved to be a very good milk producer. Reviewed literature suggests that this breed suits best to the harsh tropical climatic conditions and can be propagated for sustainable dairy farming.

Keywords: Indigenous cattle, tropical climate, milch breeds

1. Introduction
India has a large diversity of cattle genetic resources comprising 16% of the worlds cattle population, which is reflected through 41 distinct breeds of cattle distributed throughout the country and classified according to their utility as drought [28], dual [8] and milch [5, 1]. Tharparkar is one of the most important milch breed of western arid region of India, which can withstand harsh desert climatic conditions, and provide livelihood security to the rural masses of the area hence it may be considered as a potential milch genotype of the country [2]. Tharparkar is considered to be the hardiest, disease resistant, heat tolerant and tick resistant indigenous cattle breed of the country. Tharparkar cattle play an important role in milk production and economic assistance to the farmer with almost zero input in the arid region and drought prone region of north-western [1]. India, especially Jaisalmer, Jodhpur (Rajasthan) and Kutch region of Gujrat. When left on arid pasture the milk production is approximately 1135 kg per lactation, while those animals maintained in the villages average 1980 kg [2]. The breed has been widely used for crossbreeding with exotic breeds to develop high yielding crossbred cattle under Indian conditions the breed is continuously used for upgrading the low productive non-descriptive cattle.

Table 1: Estimated number of Tharparkar breed animals

Breed Name	Pure (no.)	Graded (no.)	Total (no.)	Percentage share with respect to total
Tharparkar	1,97,291	5,35,182	7,32,473	0.48

Source: Basic Animal Husbandry Statistics, 2016 (3)

2. Origin and distribution
Tharparkar is a lyrehorned type of zebu cattle originated from Tharparkar district of southeast Sind in Pakistan. In India, these animals are found along the Indo-Pak border covering western Rajasthan and up to Rann of Kutch in Gujarat. The Tharparkar is, however, known differently in its own region. In its native tract and in neighboring areas, the breed is called Thari, after the desert of Thar [4] and it is also occasionally known as Kutchi, because the breed is also found on the borders of Kutch which adjoins Tharparkar to the south. In the past these cattle were known as White or Gray Sindhi, since they are native to the Province of Sind and similar in

size of the Red Sindhi: this name, however, is no longer used. Animals with typical characteristic of the breed are found in Jodhpur, Barmer, Jaisalmer districts of Rajasthan and Kutch region of Gujarat [5]. In breeding tract, the Tharparkars are usually kept in herds of 50 to 300 animals by professional breeders called Maldars.

3. Morphological characteristics

Animals of the Tharparkar breed are deep, strongly built, medium-sized, with straight limbs and good feet, and with an alert and springy carriage. As the animals are not handled frequently they are apt to be wild and vicious. The usual color of the cattle is white or gray [6]. In males, the gray color may deepen, particularly on the fore and hind quarters. All along the backbone there is a light gray stripe. The color of the cattle deepens during the winter months and also when the cows are pregnant. The head is of medium size, the forehead broad and flat or slightly convex above eyes: the front of the horns and face are practically on one plane. The eyes are full and bright. The hump in males is moderately well developed, firm and placed in front of the withers. The dewlap is of medium size and the skin is fine and mellow. The navel flap in the females is prominent [4, 7].

Table 2: Body Measurements (in cm) of typical Tharparkar animals

Details	Male		Female	
	Maximum	Minimum	Maximum	Minimum
Height behind hump	135	122	130	114
Length from point of shoulder to pin-bone	163	145	152	137
Length of quarter from angles of hip to pin-bone	51	43	46	41
Height at angle of hip	135	122	127	114
Width between angles of hip	51	41	48	38
Height at pin-bone	124	112	118	104
Girth	191	163	186	157
Height at point of elbow	79	66	74	61
Measurement of bone below knee	23	18	19	15
Length of face immediately above eyes	27	24	23	19

Source: Indian Council of Agricultural Research (8)

4. Special features

Tharparkar breed's ecophene is well adapted to the hostile environment with extremes of temperature ranging from subzero to fifty-degree Celsius, shadow of sand storms, recurrent femines and xerophyllic vegetation which are totally unsuitable for dairy animals [9]. In the northwestern part of Rajasthan animals are generally not provided with shelter or houses throughout the year excepting on certain chilly nights or during extreme summer season [7].

Some studies conducted on physiological, and behavioral profile of Tharparkar and Karan Fries (KF) heifers under different heat stress conditions (the exposure conditions 40°C with two levels of CO2 500 ppm and 600 ppm with RH 55±5% and exposure conditions 42°C with two levels of CO2 500 ppm and 600 ppm with RH 55±5% were taken as treatments, and the exposure [8] period in each condition was of 4 h daily for 5 consecutive days) and revealed that the physiological responses (respiration rate [RR], pulse rate [PR], and rectal temperature [RT]) were significantly ($p<0.01$) higher and different during all exposure conditions compared to control condition in both the breeds however, the KF heifers had higher RR, PR, and RT than Tharparkar heifers. Among behavioral parameters standing time, panting, tongue protrusion and water intake was higher in both the breeds however, the changes were lower in Tharparkar heifers than KF. These results confirm that Tharparkar is more heat tolerant breed than KF [10].

Similarly, some studies were conducted to understand the dermal fibroblasts responses upon heat-stress and to establish dermal fibroblast cell culture of cattle (Tharparkar, Sahiwal, Karan-Fries cows) and Murrah buffalo and assess the effect of heat stress on the gene expression, apoptosis, biochemical and enzymatic characteristics. They observed that there are species and breed differences in cellular stress markers (ROS, NO, Cytotoxicity and IL-6), Antioxidants (SOD, Catalase, GPx, GR and Glutathione). These differences are important for certain aspects of species and breed differences in resistance to thermal stress. The results also showed that heat stress affect expression of a significant numbers of genes (HSP70, MMPs, iNOS, Caspase and Bcl-2 family) of diverse biological functions and apoptotic responses to thermal stress. Tharparkar and Sahiwal showing high basal levels of HSP70, Low level of inducible MMPs and iNOS which indicate more thermo-tolerance at given temperature than Karan-Fries and Murrah buffaloes. The lower expressions of Caspase genes (Caspase-3 & 7), less reduction in Bcl-2/Bax gene ratio, lower activities of Caspase enzymes (Caspase-3, 7, 8 & 9) and lesser number of apoptotic nuclei in Tharparkar and Sahiwal than Karan-Fries and Murrah buffaloes indicate that Tharparkar and Sahiwal are more thermotolerant as compared to KaranFries and Murrah buffaloes [11].

The thermotolerance power of Tharparkar breed is also supported by many gene and genotypic studies [12] reported genotype AA was superior ($p\leq0.01$) and has strong association between the HSP70 polymorphism and heat tolerability parameters, with the allele A having a positive effect on heat tolerance and genotype AA being superior in heat tolerance in Tharparkar breed. HSP70 is possibly involved in heat stress adaptive response in Tharparkar cattle and the biphasic expression pattern may be providing a second window of protection during chronic heat stress [13]. The *ATP1A1* gene could be potentially contributing to thermotolerance in Tharparkar breed [14].

Tharparkar breed seemed to have relatively better resistance for mastitis compared to other breeds. The incidence of mastitis was low in Tharparkar (12.50%) then in Gir (26.99%) cows in their breeding tracts [15]. The mean basal value of milk SCC in Tharparkar cattle under field condition was fairly low (0.655 x 105 cells ml-1) [16].

5. Breed Development Programs

The efforts of the government and other organizations are continuing to improve the productivity of a breed, and for the rearing bull mothers of breeds, Central Cattle Breeding Farm (CCBF) was established in 1986 at Suratgarh (Tharparker and its crosses with Holstein Friesian). In order to compliment and

supplement the efforts made by the States for promotion, development and conservation of indigenous bovine breeds including breeds of Gir, Sahiwal and Tharparkar Government of India has initiated following programmes (i) Rashtriya Gokul Mission a new initiative initiated as a part of National Programme for Bovine Breeding and Dairy Development exclusively for development and conservation of indigenous bovine breeds including Gir and Sahiwal breed of cattle; (ii) National Dairy Plan-I a World Bank assisted project being implemented in 18 major dairy States covering development and conservation of 6 indigenous breeds of cattle namely (i) Gir (ii) Kankrej (iii) Tharparkar (iv) Sahiwal (v) Rathi and (vi) Hariana cattle breeds [17]. Government has also established three subordinate organizations namely (i) Central Cattle Breeding Farms (CCBFs) (ii) Central Herd Registration Scheme and (iii) Central Frozen Semen Production & Training Institute for development and conservation of indigenous breeds including Tharparkar cattle [17]. For conservation of the breed Rajasthan government is running a Rajasthan Gau Sewa Sangh, Gaushala, Durgapura, Jaipur which is maintaining more than 100 pure Tharparkar breed animals [18]. Also, the different state governments and Institutes of the country are also running farm/herd for the conservation and development of the breed. These governments and institutional farms are listed as below: -

Table 3: List of Government and other institutional Tharparkar breed farms

State	Place	Farm
Andhra Pradesh	Kampasagar, Karimnagar, Mamnoor	Govt. of Andhra Pradesh
Bihar	1.Ranchi 2. Sairakela	1. Birsa Agril Univ, 2. Govt. of Bihar: Purnea
Haryana	1. Hisar 2. Karnal	1. Government Livestock Farm 2. National Dairy Research Institute
Maharashtra	Yeotmal	Govt.of Maharashtra
Rajasthan	1.Suratgarh 2. Jodhpur	1. Central Cattle Breeding Farm 2. Central Arid Zone Research institute
Tamil Nadu	Chettinad	Govt of Tamil Nadu
Uttar Pradesh	1. Lakhimpur 2. Bharari	1. Central Cattle Breeding Farm 2. Govt of Uttar Pradesh

Source: Department of Animal Husbandry and Dairying and Fisheries [17]

6. Production and Reproduction Performance

Performance traits aiming at describing the norms of the Tharparkar breed from the point of view of production, reproduction and growth have been reported by several workers particularly farm data study of various locations. The production performances viz., age at first calving, 305 days lactation yield, lactation length, dry period, service period and calving interval has been presented in table 4.

Table 4: Overall production performances of Tharparkar breed

Reproductive Traits		
Traits	**Average**	**Source**
Age at first calving (AFC)	1117.50 ± 18.60 days to 1603.67 ± 67 days 1876.17 ± 40.66 days 1769.07± 29.80 days	(19) (20) (21)
Calving interval	455.60 ± 8.50 days to 528.02 ± 13.74 days 399.97 ± 2.44 days	(22) (21)
Service period	132.29 ± 9.37 days to 252.14 ± 13.49 days 152.04 ± 4.58 days 122.04±4.264 days 117.53± 2.39 days	(23) (20) (24) (21)
Production traits		
Dry period	100.93 days 105.61±19.36 days 105.03 ± 2.09 days	(2) (25) (21)
Lactation length	240.25 ± 6.61 to 355.61 ± 6.53 days 307.30 ± 1.08 days 288.68 ± 3.14 days 279.19±3.271 days	(26) (2) (20) (24)
Lactation yield	912.55±47.71 to 2167.00 litres 1975.83 ± 10.90 kg 2064.57 ± 18.02 kg	(27) and (28) (2) (20)
Milk yield per day	5.42 ± 0.06 litres/day to 6.54 ± 0.16 litres/ day 6.12 ± 0.05 kg 4.65±0.13 litres 7.44 ± 0.06 kg 7.45±0.088 kg	(29)) & (30) (2) (25) (20) (24)
Life time performance traits		
Herd life	2657.2 days to 3540.57 ± 29.74 days	(31)& (2)
Productive life	1460.00 days to 1867.34± 96.82 days	(31) & (2)

7. Production performance of Tharparkar cattle at different farms in india

The information available on performance of Tharparkar cattle at different farms in India under various agro-climate zones is compiled and presented in Table 5. National Dairy Research Institute Karnal recorded 2104 kg in 305 days lactation yield of Tharparkar cows [32] this proves this breed is worth for milk production.

Table 5: Productive Performance of Tharparkar cattle at various herds in India

Parameter	NDRI herd Karnal	CAZRI herd Jodhpur	CCBF herd Suratgarh	Govt livestock farm Hisar
Age at maturity (months)	26	33.20	36	36
Age at first calving (months)	42.4	43.49	45	47
Total lactation yield (kg.)	2334.0			
Lactation length (days)	330	326.32	280	
305 days lactation yield (kg.)	2104.0	2079.0	2000	1804
Dry Period (days)	114	110.0		
Calving Interval (months)	13.66	13.88	13.66	
Service period (days	136			
Best Yield in a day (kg)	19.5	15.2		
Source	(32)	(33)	(34)	(34)

8. Performance of Tharparkar breed with different crosses:

Performance regarding age and weight at first conception and calving, service period, lactation length, dry period and inter-calving period, as well as milk production in first, second, third, fourth and subsequent calving's were evaluated among contemporary half-bred Tharparkar crosses with Friesian, Brown Swiss and Jersey bulls. On the basis of the overall performance, it is recommended that Friesian should be the choice of temperate dairy breed for cross-breeding of indigenous cattle in Indo-Gangetic Plains of India. The half-bred Friesian x Tharparkar cows mature at 18.98 ± 0.34 months when their average body weight is 272.18 ± 3 .12 kg. [35]

Table 6: Performance of Friesian, Brown Swiss and Jersey crosses with Tharparkar at NDRI, Karnal (35)

Breed of sire/dam	Age at first calving, months	First lact. (305 days) milk, kg	Calving interval, days	Calf mortality %
Friesian x Tharparkar	28.5	3392	363	6.0
Brown Swiss x Tharparkar	30.5	2755	409	7.7
Jersey x Tharparkar	27.8	2714	384	2.4
Friesian and Jersey x Tharparkar	31.6	2283	460	8.4

9. Mortality pattern in Tharparkar breed and other dairy breeds

Table 7: Seasonal mortality (%) pattern in Tharparkar and other dairy cattle breeds [36]

Season	Tharparkar	Sahiwal	Karan Swiss	Karan Fries
Hot-dry	2.28	5.04	4.90	4.38
Hot-humid	1.20	4.61	5.78	4.77
Cold	3.13	4.70	4.77	4.33
Overall	7.21	14.35	17.12	13.46

10. Conclusion

Tharparkar breed makes its distinct identity amongst all indigenous cattle breeds with unique characters like thermal tolerance and disease resistance, and ability to produce under harsh tropical climatic conditions. This breed can be propagated widely for upgrading low producing non-descript cattle population in the country. In milieu of global warming and climate change scenario, and its effects on dairy cattle productivity Tharparkar breed provides the best option for sustainable dairy farming under tropical climate.

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