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Conservation and improvement of Kankrej cattle (*Bos indicus*): Status *vis-à-vis* strategies

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ABSTRACT

The present study was conducted at Livestock Research Station, to compare performance of Kankrej cattle at farm and field condition, and to suggest strategies for the overall improvement of this prestigious breed. The average lactation yield (lit.), standard lactation (lit.), fat percentage, age at first calving and calving interval in the farmers herd was 1669.96±12.24 (1523), 1751.23±12.94 (617), 4.13±0.03 (617), 1464.08±18.41 (260) and 549.93±8.61 (387), respectively during the initial phage of progeny testing program initiated by station and the performance of migratory herd was 2.64 litre (wet average). While, the average lactation yield (lit.), standard lactation (lit.), fat percentage, age at first calving and calving interval at station was 2682.27±126.71 (59), 2501.15±87.72 (59), 4.08±0.09 (49), 1218.42±35.27 (12) and 435.73±13.94 (36), respectively (Elite herd, Anonymous 2018). The lactation yield of daughters born under the progeny testing program was 2050.29±119.20 (104) litres. Looking to the performance gap between the herd maintained at station, field and pastoralist indicates wide scope for the genetic improvement in Kankrej breed by following strict breeding strategies which are discussed in this paper. Conclusively, intensive selective breeding with the use of artificial insemination technology at large scale and progeny testing with precise recording at small scale will solve the purpose in the non-migratory population while, supply of high genetic merit male calf or proven bull's male calf to the Maldharis having migratory population.

Keywords: Breeding strategies, Kankrej breed, Pastoralism, Progeny testing

Pastoralism and cow herding is an Indian culture followed since ancient time and had provided many breeds and strains of cattle, buffalo, sheep, goat, camel and many more. Kankrej breed of cattle is one of them developed through continuous efforts of selection by farmers as well as pastoralists/maldharies with distinct characteristics from other breeds but neglected since last few decades because of fair production and lesser use of bullocks for draught purpose for which it is known. Among all cattle breeds, Kankrej breed is considered to be a one of the oldest breeds of cattle as evident from wall pictures, statues and images from *Sindhu culture, Haddappa* and *Mohenjo-daro* cultures (white humped cattle with large half-moon shaped horn and a well-developed dewlap). The country's population of 192.49 million cattle accounts for 17% of the total world population of cattle (Livestock Census 2019). The population of Kankrej breed is 30.28 lakh, of which 19.45 lakh cattle are pure and 10.83 lakh are graded. It is well adopted in North Gujarat as compared to other cattle breeds. Kankrej breed was named after Kankrej tehsil of Banaskantha district, Gujarat but it is abundantly found in Banni tract of Kutch District, North Gujarat and part of Rajasthan adjoining to Gujarat. The average milk yield is 1,200–1,600 kg per lactation. Bullocks are strong and hard-working. The production performance of this breed is poor in the field condition because of migratory nature of majority herds hence, they are not covered under any genetic improvement program. Thus, looking to the importance of Kankrej breed, station has initiated breed improvement program with an aim to conserve, improve and propagate this precious germplasm. The station was established in the year 1978 and since then untiringly working for the inclusive development of this breed. The objective of this study, is to know the present performance at farm, field, gaushala and migratory herds and to come up with the improvement strategies on the basis of past experience for the comprehensive development of Kankrej breed the pride of India.

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MATERIALS AND METHODS

The data recorded during last four decades at Livestock Research Station, S.D. Agricultural University, Sardarkrushinagar was utilised for the present study to know the performance at Farm level. The data recorded either through detailed survey (migratory herd) or recording (non-migratory herd) under associated progeny testing project were utilised for the present study to know

the performance of field animals.

Project coverage area: Total 14 artificial insemination centres running in the field covering 64 villages, 5,200 farmers, 2 *gaushalas* and 6,200 breedable females in the six talukas (viz. Kankrej, Deesa, Deodar, Dhanera, Lakhni and Tharad) of Banaskantha district, north-Gujarat.

Topography and climatic condition: Geographically, the station is located in north Gujarat at an altitude of 136 meters above the mean sea level. It lies at latitude of 24.35° North and longitude of 72.59° East. The climate of the farm is semi-arid and tropical in nature. All age groups of the animals are reared under similar climatic conditions. Generally, winter (November to February) remains fairly cold and dry, summer (March to June) is moderately hot and dry while monsoon (July to October) is hot and extremely humid.

Data analysis: Descriptive statistics (mean±S.E.) were calculated and data were analyzed using standard statistical procedure to compare the performance of Kankrej cattle at farm and field level.

RESULTS AND DISCUSSION

Performance of Kankrej breed under field condition (*non-migratory herd*): In the beginning of the progeny testing project, detail survey was carried out to know the status of Kankrej breed in the villages of the home tract of Kankrej cattle. The average lactation yield (lit.), standard lactation (lit.), fat percentage, age at first calving and calving interval in the farmers herd was 1669.96±12.24 (1523), 1751.23±12.94 (617), 4.13±0.03 (617), 1464.08±18.41 (260) and 549.93±8.61 (387), respectively. Majority of farmers are following natural service to bred their cows with stray bulls and very few gaushalas/pinjrapoles are using bulls of known pedigree and keeping records of breeding, feeding and production.

Performance of Kankrej breed under field condition (*migratory herd*): There are on an average 30 professional breeders maintaining 493 Kankrej cattle per village in Banaskantha districts (Patel 2014). The herd size is 34 (22 breedable) animals per professional breeders. Almost 97% of professional breeders breeds their cows with bulls selected either from same or other herds without history, of which only 45% bulls meet the true breed characteristics. This leads to indiscriminate/inbreeding. The adoption of artificial insemination is only 3.3% among professional breeders. The production potential is also very poor (wet average = 2.64 litre). Almost 80% Kankrej population is migratory type either in Gujarat or adjoining part of Rajasthan hence, recording of other data is difficult. The improvement of these animals is big task and needs special attention.

Performance and genetic improvement of Kankrej breed at LRS, SDAU (*1978–2018*): Kankrej cattle breed which is reared at LRS, SDAU, Sardarkrushinagar, Gujarat, proved to be a superior to crossbreed/indigenous cattle in terms of reproduction, disease resistance and at par in terms of milk production. It is well known for milk yield, disease resistance and production of bullocks for heavy draft utility and agricultural works. Average lactation yield of the Kankrej herd at LRS, SDAU was recorded as 2682.27 litres, and few animals have yielded even more than 5,000 liters per lactation (Anonymous 2018). The use of superior male animals with high genetic potential can further improve the productivity of this breed. The improvement achieved in Kankrej breed during last 4 decades is summarised as under.

Scope for the improvement in Kankrej breed: The performance gap (almost double) between herd maintained at LRS, SDAU and animals maintained in the field indicates huge scope for the improvement in Kankrej breed. It has very good potential in terms of milk production and reproduction, which is at par with the performance of milch breed and crossbreds. The highest records milk yield 7251 litres/lactations (5415 litres in 305 days) adds further possibility/scope for the improvement (Anonymous 2014, Anonymous 2018).

Improvement in Kankrej breed covered under project (*2009–2018*): The genetic improvement achieved in Kankrej breed was not kept limited to station but it has been also extended to the farmer's door. In the year 2009–10, the field progeny testing program was started with the aim to improve the farmers herd utilising the upgraded genetic material and facilities available with the station. Semen station was also established in the year 2010–2011 for semen production from high genetic Kankrej males born to elite cows. First set of bulls had completed its progenies records the performance of first set daughters (Table 2). The average of daughters is 2050.29 litres which is higher than the average of their dams. The breeding value ranging from 33 litres to 156 litres and the use of these proven/ ranked bull will further enhances the genetic gain in future (Singh *et al*. 2018).

Brief success story of progeny testing program, LRS, SDAU: The progeny testing program was started in 2009 with the aim to improve Kankrej cows maintained by farmers in the home tract. A total of 48 villages covering 5,200 farmers, 6,200 Kankrej cows covered in the program. A total of 19,098 inseminations were carried out, of which 8,103 cows conceived and almost 2,567 female progenies born since inception. Total three sets of 8–9 bull were inducted in the field. The first set was proven and daughters (333) were producing almost 200 litres more yield than that of their dams. The breeding values of bull ranging from 33.75 litres to 156.00 litres. The use of proven bulls of first set will further improves the yield in farm and field and fasten the genetic gain. Few of the successful farmers started shifting from crossbred and buffalo to Kankrej breed (Patel *et al*. 2014, 2016).

Improvement strategies for the farmers and gaushalas (*non-migratory*) *maintaining Kankrej cattle:* The major factors that determines the success or failure of breeding program are the relevance of the breeding program in prevailing scenario, objectives/goals of the program and breeding strategies (Barker 1992). Therefore, the breeding objectives must be relevant to the prevailing production

Table 1. Improvement in productive and reproductive parameters in Kankrej cattle at Livestock Research Station, SDAU, Sardarkrushinagar (4 decades)

Trait	1978–85	1986–90	1991–95	1996–00	2001–05	2006–10	2011–15	2016–17
1st lactation yield (litres)	918.00	1356.00	1586.00	1760.00	1857.00	1969.00	2219.00	2205.00
Lactation yield (litres)	977.00	1378.00	1709.00	1855.00	2045.00	2199.00	2315.00	2572.00
Lactation length (days)	225.00	265.00	284.00	271.00	282.00	283.00	296.00	293.00
Dry days	198.00	186.00	196.00	156.00	142.00	128.00	127.00	123.00
Calving interval (days)	433.00	455.00	472.00	443.00	443.00	411.00	422.00	432.00
Age at 1st calving (days)	1522.00	1394.00	1464.00	1412.00	1393.00	1224.00	1292.00	1212.00
Service period (days)	155.00	134.00	159.00	123.00	143.00	112.00	134.00	151.00
Wet average (litres)	3.71	5.02	5.91	6.82	7.62	7.84	8.70	8.31
Herd average (litres)	1.57	2.82	3.71	4.21	4.64	4.99	5.58	5.18
Bull sold to the farmers	4.00	15.00	26.00	31.00	29.00	61.00	49.00	37.00

system of an area and hence the following strategies are recommended for the non-migratory herd like farmers.

The farmers keeping on and average one to two Kankrej along with crossbred cattle and buffaloes. These animals can be covered under the AI network and progeny testing program so that the faster genetic gain is expected. At present, almost 90% Kankrej population is not covered under AI network. Except Banaskantha, Kankrej population in other part of Gujarat and Rajasthan is almost under natural breeding. Artificial insemination network needs to expanded in these areas. Parallelly, small scale progeny testing may be continued for the production of future test bulls using semen of proven bull in farm and field to increase genetic variation. Intensive selective breeding and small-scale progeny testing with precise data recording is the only way to achieve faster genetic gain at farmers door. Extension services to strengthen the knowledge of farmers regarding scientific rearing of animals and importance of indigenous cattle is also required.

In the *gaushalas* where facilities and resources are available, the herds may be separated in to two parts as production and non-productive groups. Productive groups may be covered under AI coverage or high genetic merit bull may be given for natural service while non-productive animals and male may be maintained separately to avoid indiscriminate breeding while, in some gaushalas where recording facilities are available and having good genetic potential may be covered under progeny testing so that elite cows can be produced at faster rate.

Table 2. Least Squares means and expected breeding values of Set-I

Factor	No. of daughters	Data		
		Least squares mean	Expected breeding values	Ranking
Overall	104	2050.29±119.20		
K006	10	1968.55±154.88	– 81.74	7
K007	20	2034.77±135.08	– 15.52	5
K010	08	1981.40±152.26	– 68.88	6
K012	08	2126.51±159.88	+ 76.22	2
K014	20	1905.31±121.51	– 144.98	8
K016	18	2084.04±143.87	+ 33.75	4
K017	10	2095.44±153.88	+ 45.15	3
K020	10	2206.29±115.90	+ 156.00	1

Improvement strategies for the pastoralist/maldharis maintaining Kankrej cattle: There are on an average 30 professional breeders maintaining 493 Kankrej cattle per village in Banaskantha districts (Patel 2014). The herd size is 34 (22 breedable) animals per professional breeders. Almost 97% of professional breeders breeds their cows with bulls selected either from same or other herds without history, of which only 45% bulls meet the true breed characteristics. This leads to indiscriminate/inbreeding. The adoption of artificial insemination is only 3.3% among professional breeders. The production potential is also very poor (wet average = 2.64 litre). Almost 80% Kankrej population is migratory type either Gujarat or adjoining part of Rajasthan. The improvement of these animals is big task and needs special attention. Hence, adoption of intensive selective breeding, artificial insemination and progeny testing for the nomadic Maldharis is difficult rather impossible task. Lack of pure breed characteristics and breeding knowledge in addition to fodder scarcity further worsens the condition. Migration from one place to another place in the search of feed and fodder, lack of market (poor marketing or less milk price by middle mans), lack of health facilities and many more problems are also amalgamated with Maldharis. In these circumstances, the provision of high genetic merit male calf of one to one and half year age (so, it can adopt the migratory life otherwise adult bull may die because of feed, water and migration) and castration of male in herd is the only imaginable way for the improvement. To the smaller extent the use of proven bull's son born under progeny testing program in the areas of lesser migration with little bit availability of resources will be the hope in addition to extension education regarding genetic purity of breeding bulls. Provision of young calf instead of adult male is only recommended because it can

adopt with migratory herds otherwise for adult it is difficult.

A reliable database should be developed with regard to all the details of population, including their breeding tracts, numbers, characteristics, genetic make-up, germplasm, the institutions/ potential farmers where they are being preserved and/ or conserved and so on. Databases should also be developed with regard to Kankrej graded population so that necessary strategies can be further implemented. Intensive selective breeding with the use of artificial insemination technology at large scale and progeny testing with precise recording at small scale will solve the purpose in the non-migratory population while, supply of high genetic merit male calf or proven bull's male calf to the Maldharis having migratory population.

To sum up, it is beyond doubt that Kankrej has potential for the production and reproduction in extreme environmental or in tropical condition where the crossbreeding has not proven better as far as reproduction, disease resistance and sustainability of production in hot summer season. Therefore, the time has come to give more emphasis on genetic improvement of our indigenous stock as well as to value addition of the innate attributes indigenous cattle possessing in terms of milk and its constituents, higher disease resistance and endurance to heat. The above performance of Kankrej clearly suggests that it can equally produce and reproduce to crossbred. It has been well established in current research that the A2 allele responsible for milk quality as far human health is concern is 94–100% in indigenous cattle. The population size of Kankrej is also huge so improvement of one litre per day may be more advantageous than the breeds whose population is smaller in number. Therefore, due attention needs to be given to improve the productive and reproductive performance of cattle at farmers door. The improvement of AI network under field conditions is the need of hour to disseminate superior germplasm from Kankrej bulls at the door steps of the farmer as it is available with station and use of pedigreed/proven bull's son.

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