



*Original Research*

## Effect of Non-Genetic Factors on Disposal Pattern in Tharparkar Cows

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### Abstract

Data on 166 Tharparkar cows were collected for a period of 1991 to 2013 and classified into four period of calving and four season of calving to study the disposal pattern. Analysis for total lifetime milk yield were conducted upto 5<sup>th</sup> parity as 83.39% of cumulative total milk yield (%) of Tharparkar cows was within the parity. Descriptive statistics were computed for analysis of disposal pattern, whereas effect of non-genetic factors on disposal pattern was analyzed using Chi square statistic. The overall disposal in adult cow per lactations basis was 31.11% (Mortality rate: 3.33% and culling rate: 27.78%) but overall disposal upto fifth parity was 29.88% (culling rate: 26.5% and mortality rate: 3.32%). The overall disposal in adult cows was higher in third parity (33.3%) and lowest in fifth parity (24.3%). The effect of season of calving on overall disposal rate in third lactation was significant ( $P < 0.01$ ), whereas, the effect of period of calving was highly significant ( $P < 0.01$ ) in the first and fifth lactation. Average culling rate (lactation basis) was 27.78% and average mortality rate was 3.73%. The major reason of culling (lactation basis) was reproductive problems (10.12%), and maximum mortality occurred due to debility (0.9%).

**Key words:** Culling, Disposal, Mortality, Parity, Tharparkar

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### Introduction

Tharparkar is a dual-purpose breed, valued for its milk and draught utility, and is well adapted to hostile Thar Desert conditions of Rajasthan typified by summer temperature hovering above 50°C, sparse rainfall and vegetation, and scarcity of even drinking water (Sodhi *et al.*, 2006). The breeding tract of the breed includes Kutch district of Gujarat and Barmer, Jaisalmer and Jodhpur districts of Rajasthan. Over the years elite animals of this breed have been frequently used for upgrading local low-yielding cattle breeds. Further,



due to better heat tolerance and disease resistance, this breed was used for development of synthetic crossbred “Karan Fries” cattle in 1971 at ICAR-National Dairy Research institute (NDRI).

Disposal of animals is a major constraint in achieving profit in livestock farm that includes both culling and mortality of animal under different age groups. Culling is broadly classified as voluntary (freedom of choice over the removal of a cow from the herd due to low milk production or old age) and involuntary (there is no choice but it is necessary to remove the animal from the herd; for the reasons as infertility or infectious diseases) (Grohn *et al.*, 1998). Voluntary culling is considered desirable and usually related with increased profits while involuntary culling leads to economic losses. Small size of herds and involuntary disposal of animals are major constraints in selection intensity and hence genetic improvement of cattle. Genetic improvement of animals is much dependent on herd size, as larger herd size facilitates in more opportunities for voluntary culling. Mortality pattern indicates the herd health status and efficiency of routine herd management. Knowledge about the reasons of culling and mortality pattern of cows of an organized herd is important to improve animals through better management and effective selection. The information is scanty on disposal pattern of Tharparkar cattle as a very few herds of this breed exists in India. Therefore, the study was planned to examine the effect of non- genetic factors on disposal pattern of Tharparkar cattle in an organized herd.

### Materials and Methods

The data comprised of records on 166 Tharparkar cows, maintained at Animal Genetics & Breeding Division and Livestock Research Centre, ICAR-National Dairy Research Institute, Karnal (Haryana) during 1991 to 2013 was used. Season of calving was classified as, winter (December-March), summer (April-June), rainy (July-September) and autumn (October-November). Year to year variations were expected to be small and hence, the year of calving were grouped into periods as period 1 (1991-1995), Period 2 (1996-2000), Period 3 (2001-2005) and Period 4 (2006-2013). The parity of cows was classified as 1<sup>st</sup> to 5<sup>th</sup> parity for overall disposal estimation. Data were analysed to investigate cumulative culling and mortality rate on per lactation and per cow basis up to disposal.

The reasons of disposal in Tharparkar cows were broadly divided into mortality and culling. Reasons of culling were categorized under udder and teat problems, leg deformity, poor health low milk production, surplus, whereas, reproductive problems were prolapse, adhesion of reproductive organs, abortion, cystic ovary, metritis, repeat breeder and irregular cycles and miscellaneous reasons were ferocious, peritonitis, off colour, off breed, allergic skin condition and old age. The following parameters were computed from the data.

### Mortality Rate at Subsequent Lactations

It is percent lactating cows died out of total lactating cows entered in a given parity in the milking herd.

### Culling Rate at Subsequent Lactations

It is percent lactating cows culled out of total lactating cows entered in the given parity in the milking herd.

### Statistical Analysis

Influence of various non-genetic factors *i.e.* season of calving and period of calving on disposal pattern was assessed using Chi-square method (Snedecor and Cochren, 1994) as-

$$\chi^2 = \sum[(O - E)^2 / E]$$

Where, O = Observed frequencies, E = Expected frequency

Expected frequencies were calculated as follows-

$$E_{ij} = (R_i)(C_j) / GT$$

Where,  $E_{ij}$  = Expected frequency of the observation pertaining to  $i^{\text{th}}$  row and  $j^{\text{th}}$  column,  $R_i$  =  $i^{\text{th}}$  row total,  $C_j$  =  $j^{\text{th}}$  column total, GT = Grand total

The association between two variables was analyzed using Chi-Square statistics.

### Results and Discussion

Total lifetime milk yield of the herd of Tharparkar cows was 595131.9 Kg out of which 496328.5 Kg was obtained within 5<sup>th</sup> lactation which accounts for approximately 83.39% of cumulative total milk yield (Table 1). As, maximum production of lifetime milk yield in Tharparkar cows were covered within 5<sup>th</sup> lactation, so, analysis for studying disposal patterns until this parity were conducted in the present study.

**Table 1:** Cumulative milk yield of 305 days of Tharparkar cows

Lactation Order	No. of Animals (N)	Total 305 days Milk yield (Kg)	Cumulative Total Milk Yield (Kg)	Cumulative Total Milk Yield (%)
1	166	150277	150277	25.25
2	115	134090	284367	47.78
3	81	95969.4	380336.4	63.9
4	54	70440.5	450776.9	75.74
5	37	45551.6	496328.5	83.39
6	23	36838.6	533167.1	89.58
7	17	25597.5	558764.6	93.88
8	13	14121.9	572886.5	96.26
9	9	13703	586589.5	98.56
10	6	7593	594182.5	99.84
11	2	756.9	594939.4	99.96
12	1	192.5	595131.9	100

In an organized herd young female calves enter the milch herd and a number of adult animals are disposed of due to involuntary disposal comprising of mortality and culling. With an overall view of examining the

herd dynamics, the records of Tharparkar cows were analysed to study the disposal pattern in different lactations.

### Incidence and Influence of Non-Genetic Factors on Overall Disposal upto Fifth Lactation

The percent of Tharparkar cows disposed in 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> parities were 30.7, 29.6, 33.3, 31.5 and 24.3, respectively with overall disposal of 29.88% (Table 2).

**Table 2:** Effect of season and period of calving on overall disposal of Tharparkar cows upto fifth lactation

Effects	N	First Lactation	Second Lactation	Third Lactation	Fourth Lactation	Fifth lactation	Average disposal rate (Lactation basis)
Overall disposal	16	30.7 (51)	29.6 (34)	33.3 (27)	31.5 (17)	24.3 (09)	29.88 (138)
No. of records	6	166	115	81	54	37	453
<b>Season of calving</b>							
Winter	70	21.4 (15)	29.0 (16)	25.6 (10)	27.6 (08)	23.8 (05)	25.2 (54)
Summer	47	36.2 (17)	30.0 (09)	38.0 (08)	15.4 (02)	18.2 (02)	31.2 (38)
Rainy	33	36.4 (12)	33.4 (07)	64.3 (09)	60.0 (03)	0	41.4 (31)
Autumn	16	43.8 (07)	22.3 (02)	00.0 (00)	57.1 (04)	66.7 (02)	33.4 (15)
Chi square value		5.27	0.38	11.53**	5.83	2.89	
<b>Period of calving</b>							
P1 (1991-1995)	54	14.8 (08)	23.9 (11)	25.7 (09)	34.6 (09)	11.8 (02)	21.9 (39)
P2 (1996-2000)	18	11.1 (02)	25.0 (04)	16.7 (02)	20.0 (02)	12.5 (01)	17.2 (11)
P3 (2001-2005)	40	35.0 (14)	26.9 (07)	52.6 (10)	22.2 (02)	14.3 (01)	33.7 (34)
P4 (2006-2013)	54	50.0 (27)	44.4 (12)	40.0 (06)	44.4 (04)	100 (05)	49.1 (54)
Chi square value		20.12**	4.03	6.46	2.52	17.91**	

N: Total number animals; Figures in parenthesis indicate the number of animals disposed; \*\* Significant ( $P < 0.01$ )

The overall disposal was lowest in the second lactation (24.3%) and highest in third lactation (33.3%). Perusal of the results across different parities and seasons revealed that overall disposal was relatively less in fifth parity. Such finding could be as most of the cows being high producers in this lactation. In case of first lactation, maximum disposal was found in autumn season (43.8%) and in fourth period (50%). Across different seasons and periods of calving, in the fifth lactation more disposals were observed in autumn season and fourth period. The effect of season of calving on overall disposal in third lactation and period of calving in first and fifth lactation were found to be significant ( $P < 0.01$ ).

### Incidence of Mortality and Culling Rate (Lactation Basis)

It was observed that overall disposal 31.11% per lactation basis among which 3.33% was due to mortality and 27.78% was due to culling (Table 3). The highest mortality rate per lactation basis (5.5%) was observed in rainy season and the lowest (2.3%) was found in summer season. Whereas, the highest culling rate on lactation basis (31.8%) was observed in summer season and the lowest (25.4%) was found in winter season.

**Table 3:** Effect of season and period of calving on culling rate (%) and mortality rate (%) in adult cows upto last parity

Effect	N	Cumulative culling (Cow basis) %	Cumulative mortality (Cow basis)%	Average culling rate (Lactation basis) (%)	Average mortality rate (Lactation basis) %
No. of records		166	166	166	166
Overall	166	84.3 (140)	15.7 (26)	27.78	3.33
Winter	70	84.3 (59)	15.7 (11)	25.4	3.3
Summer	47	89.4 (42)	10.6 (05)	31.8	2.3
Rainy	33	75.8 (25)	24.2 (08)	26.9	5.5
Autumn	16	87.5 (14)	12.5 (02)	29.8	2.7
P1 (1991-1995)	54	72.3 (39)	27.8 (15)	19.4	6.1
P2 (1996-2000)	18	88.9 (16)	11.1(02)	25	2.3
P3 (2001-2005)	40	87.5 (35)	12.5 (05)	29.9	2.7
P4 (2006-2013)	54	92.6 (50)	7.4 (04)	40.9	1.6

N: Total number animals; Figures in parenthesis indicate the number of animals disposed

In case of period, maximum mortality rate on lactation basis (6.1%) mortality rate on lactation basis was observed in first period and minimum (1.6%) was found in fourth period whereas, maximum culling rate on lactation basis (40.9%) was observed in fourth period and minimum (19.4%) was found in first period. In contrast to present study, higher (32.29%) overall disposal rate on lactation basis was reported by Singh (2001) in Karan Fries among which total loss due to mortality was 6.85% and culling was 25.43%. However, lower (27.39%) overall disposal rate on lactation basis was reported by Abbas (2005) in Sahiwal and reported that mortality was only 4.41% and culling was 22.98%.

### Incidence of Mortality and Culling at Subsequent Lactation Up To Last Parity

Out of total animals disposed (cumulative disposal) until fifth lactations, only 15.7% cows were disposed due to mortality and the remaining 84.3% were disposed due to culling (Table 3). For cumulative mortality, maximum mortality (24.2%) was found in rainy season and minimum mortality (10.6%) was observed in summer season. In case of period of calving, maximum cumulative mortality was observed during first period (27.8%) and minimum mortality was found to be in fourth period (7.4%), which may be due to improvement in management of adult cows in later periods.

Across different seasons of calving, maximum cumulative culling was found in summer season (89.4%) and minimum culling was found in rainy season (75.8%). In case of periods, maximum culling was seen in fourth period (92.6%) and minimum culling in first period (72.3%), indicating rigorous culling in later periods, to improve the productivity of the farm. Higher mortality rate was reported by Upadhyay (2013) and Abbas (2005) in Sahiwal 16.91% and 15.4% respectively, whereas, lower mortality rate was reported by various workers as 9.3% in Red Sindhi (Lathwal, 1995), 13.4% in Sahiwal (Rawal and Tomar, 1994), 9.7% in Tharparkar (Rawal and Tomar, 1998) and 11% in Haryana (Arun, 2007). Higher culling rate was

reported by Arun (2007) in Haryana (89%) whereas, lower culling rate was reported by various worker as, 83.09% and 83.89% in Sahiwal by Upadhyay, (2013) and Abbas (2005) respectively.

### Reasons of Mortality and Culling in Adult Lactating Cows

The maximum mortality in adult Tharparkar cows on per lactation basis was observed due to debility (0.90%) followed by toxemia (0.77%), infectious diseases (0.51%), respiratory problems (0.51%) and cardiac problems (0.13%). The miscellaneous (0.51%) causes of mortality were snake bite, hepatic problems, bloat condition, poisoning. Maximum disposal in culling was found due to reproductive problems (10.12%), followed by udder and teat problems (7.34%), leg deformity and leg problems (2.58%), poor health and weakness (1.59%) and low milk production (1.59%). The important reasons of mortality of cows were mainly respiratory problems, debility, toxemia and infectious diseases. Whereas, miscellaneous reasons were cardiac problems, mummified fetus and snake bite (Table 4).

**Table 4:** Reasons of mortality in lactating cows

S. No.	Reasons of Mortality	Average Mortality Rate (Lactation Basis)
1	Respiratory problems	0.51 (04)
2	Debility	0.9 (07)
3	Toxemia	0.77 (06)
4	Infectious diseases	0.51 (04)
5	Miscellaneous	0.64 (05)
Total		3.33 (26)

Figures in parenthesis indicate the number of animals died

Higher mortality rate than the present study was reported by Upadhyay (2013) in Sahiwal cattle (16.9%) and lower incidences shown by Reddy and Nagarcenkar (1989), Hadley *et al.* (2006) and Sadek *et al.* (2009) in Sahiwal (5.1%), Exotic breed (14.4%) and Holstein Frisian (12.2%) respectively.

In case of culling Singh (2001) for Karan Fries found similar results with major reason of culling as reproductive problems (5.5%). Different reasons were reported by Reddy and Nagarcenkar (1989) for culling in Sahiwal cows as low production (28.8%) and reproductive problems (18.4%), Sadek *et al.* (2009) found disease problems (40.6%) and low reproduction (7.4%) in HF.

### Conclusion

The maximum milk production (83.39%) was observed to be completed within 5<sup>th</sup> lactation in Tharparkar cows. So, special attention is needed upto this period to increase economic status of the herd. A reproductive and udder/teat problem accounted for around 2/3<sup>rd</sup> of total disposal which indicates scope of further improvement of animal health management in order to reduce involuntary culling of cows. Variability in disposal pattern in different lactation, season of calving and period of calving was observed in the study which suggested that it improvement of farm management is needed in order to reduce involuntary culling.

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## Conflict of Interest

The authors declare that they have no conflict of interest.

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