# STUDY ON MILKABILITY TRAITS OF KANKREJ COWS

D. Anand, M.M. Trivedi, A.J. Dhami , B.S. Divekar and A.M. Patel

Department of Livestock Production and Management
College of Veterinary Science and Animal Husbandry
Anand agricultural University, Anand-388 110

## ABSTRACT

The study was undertaken on 12 suckled Kankrej cows to investigate the effects of shift of milking, season and milker on milkability traits, viz. let down time, total milking time, milk yield/milking and milk flow rate. The overall mean let down time, total milking time, milk yield/milking and milk flow rate were 67.99 seconds, 262.67 seconds, 3.32 kg and 0.77 kg/minute, respectively. The differences between morning and evening milking were non-significant for let down time, total milking time and milk yield. However, milk flow rate showed significant (P<0.05) variation between morning and evening milkings. Significantly (P<0.01) higher let down time (76.66 seconds) and total milking time (317.61 seconds) were recorded in hot humid season as compared to cold dry season (63.36 and 234.90 seconds). However, average milk yield/milking showed reverse trend, wherein significantly higher (P<0.01) milk yield was recorded in hot humid season (4.02 kg vs 2.97 kg). Milk flow rate was almost similar in both hot humid and cold dry seasons. Differences in let down time, total milking time and milk flow rate in cows milked by different milkers were non-significant. Milk let down time was significantly and positively correlated with total milking time (r - 0.758). Milk yield had highly significant and positive (P<0.01) correlations with both let down time (r = 0.844) and total milking time (r = 0.963). However, milk flow rate was negatively correlated with milking time (r - -0.570).

**KEY WORDS:** Kankrej, Let down time, Total milking time, Milk flow rate, Milk yield, Correlation

## INTRODUCTION

Milking is the most important dairy management operation which directly influences the profitability of dairy farming. Efficient and rapid removal of milk from the udder should be the goal of every milking programme. Milkability traits viz. milk let down time, total milking time, milk yield and milk flow rate are important characters that decide the dairy worth of an individual cow or buffalo. Kankrej is an important dual purpose breed native of Gujarat. However, only few studies (Shiralkar and Dave, 1975; Chauhan, 2004) have been carried out on these vital aspects in Kankrej. Therefore the present study was undertaken to investigate the effects of shifts of milking, seasons and milkers on milkability traits in Kankrej cows.

## MATERIALS AND METHODS

This study was conducted on 12 suckled Kankrej cows at Livestock Research Station of the College at Anand over six months covering two seasons hot-humid (August-September) and cold-dry (October to January). All the cows were in second to fourth parity and in mid lactation at the start of the experiment. They were loose housed and kept under uniform feeding and managemental conditions throughout the study period. The cows were group fed sufficient quantity of available green forages, viz. maize, lucerne and NB21 twice in a day and *ad libitum* dry forages, like Dicanthium annulatum (matured pasture grass), bajra straw, jowar hay etc. The compounded concentrate mixture (Amul Dan) was fed individually @ 50 % of milk production over and above their maintenance allowance of 1 kg/day/head. Clean and wholesome water was provided *ad libitum* through water trough throughout the day. All the cows were milked by full hand method twice in a day at 5.30 a.m. onwards in the morning and 5.30 p.m onwards in the evening. They were milked in 26 (L) x 10 (W) m2 size tail to tail type milking parlour having East -West orientation. The height of the parlour was 3.5 meter at eves. The cows were allotted to four milkers for milking on rotation base, targeting equal frequency of milking all the cows.

The observations on milkability traits were recorded twice in a day at the time of morning and evening milking once in a week and thus for total four times in a particular month. Same schedule was continued

throughout the study. Let down time and total milking time were recorded using the stop watch with 0.1 second accuracy. Milk let down time (seconds) was calculated as the time interval from touching of teat by a calf to the first drop of milk drawn in the pail/bucket (Gupta et al., 1974). Total milking time (TMT) was calculated as the time interval from starting of milking to the end of milking (last drop of milk). After milking the total milk produced by an individual cow was weighed on dial type weighing balance with an accuracy of 0.1 kg. Milk flow rate (kg milk/minute) was calculated by dividing the total milk yield by total milking time. The data generated were analyzed by employing standard statistical design and procedures (Snedecor and Cochran, 1994).

## RESULTS AND DISCUSSION

### Let Down Time

Average let down time was found to be 69.93 and 66.06 seconds during morning and evening milking, respectively, with an overall mean of 67.99±1.69 seconds (Table 1). This was comparable to earlier reported value (64.83 seconds) in Kankrej cows (Chauhan, 2004). However, higher let down time in Kankrej cows (73.19 seconds) has been reported by Shiralkar and Dave (1975). The differences between morning and evening let down time in monthly and overall values were statistically non-significant. Similar non-significant variations between morning and evening let down time have been reported earlier in Sahiwal and Kankrej cows (Ludri et al., 1982; Chauhan (2004) and in Murrah buffaloes (Bhardwaj et al., 1987; Chhikara et al., 1993). However, Aulakh and Gupta (1994) found significant variation in let down time due to shift of milking in indigenous cows.

The highest average milk let down time was observed in the month of August (79.47 seconds) and the lowest in December (59.14 seconds). The differences in let down time due to months were highly significant ($P<0.01$). These results are in agreement with the earlier reports on Kankrej cows (Shiralkar and Dave, 1975; Chauhan, 2004). Significantly ($P<0.01$) higher let down time was observed in hot-humid season (76.66 seconds) as compared to cold-dry season (63.36 seconds; Table 2). This might be due to more stress on the cows in hot humid season. Similar significantly higher let down time was observed in hot-humid season by Aulakh and Gupta (1994) and Chauhan (2004) in indigenous cows as well as in buffaloes. The average milk let down time in Kankrej cows hand milked by four different milkers during the study is shown in Table 3. The differences in let down time due to milkers were statistically non-significant. Although maximum average let down time (69.11 seconds) was recorded in the cows milked by Milker-A and minimum (67.47 seconds) in the cows milked by Milker-C. Similar non-significant differences in let down time due to milkers were reported by Bhagat et al. (1992) and Chauhan (2004) in Murrah buffaloes and Kankrej cows, respectively. But, Shiralkar and Dave (1975) found significant variation in let down time due to milkers in Kankrej cows.

### Total Milking Time

The overall mean total milking time observed in Kankrej cows was 262.67±8.56 seconds (Table 1). This is comparable to that reported earlier in Kankrej cows (263.50 seconds; Shiralkar and Dave (1975), whereas, it was higher than 252.87 seconds reported in Kankrej cows by Chauhan (2004). Average milking time was 279.53 seconds during morning and 245.40 seconds during evening milking. The average total milking time was higher in morning milking than the evening milking throughout the study; it did not differ significantly in any of the months as well as for overall value. Similar non-significant variation in total milking time due to shift of milking was reported earlier by Gangawar (1976) and Chauhan (2004) in Murrah buffaloes and Kankrej cows, respectively. However, significant variation in total milking time due to shift of milking was observed by Singh and Tomer (1994) in crossbred cows. The higher total milking time observed at morning shift might be due to higher milk yield recorded in morning milking (3.46 kg) as compared to at evening milking (3.17 kg) (Table 1). Total milking time and milk yield had positive and highly significant ($P<0.01$) association ($r = 0.963$). Thus, higher the milk yield, higher is the total milking time and vice versa. The highest total milking time was observed in the month of August (330.53 seconds) and the lowest in January (181.63 seconds). The differences in total milking time between months were highly significant ($P<0.01$). Shiralkar and Dave (1975) and Chauhan (2004)

also reported significant differences in total milking time due to different months in Kankrej cows. There was a progressive decline in total milking time from August to January. This may be due to progressive decline in milk yield observed over the experimental period (Table 1). Thus, with the decline in milk yield, total milking time too followed same trend. Significantly higher ($P<0.01$) total milking time was observed in hot-humid season (317.61seconds) as compared to cold-dry season (234.90 seconds) (Table 2). This may be due to highly significant differences in milk yield due to different seasons (4.02 kg in hot humid vs 2.97 kg in cold dry) observed in experiment (Table 2). Partly this may be attributed to stressful environmental conditions prevailed during hot humid season, which might have lowered the efficiency of milkers. Similar significant seasonal differences in total milking time were reported earlier in Murrah buffaloes by Aulakh and Gupta (1995) and in Kankrej cows by Chauhan (2004). The average total milking time in Kankrej cows milked by four different milkers during the experiment is shown in Table 3. Maximum total milking time (270.58 seconds) was recorded in the cows milked by milker-D and minimum (252.78 seconds) in the cows milked by Milker-B. However, differences in total milking time due to milkers were statistically non-significant. Similar findings were reported earlier by Dash et al. (1976) in Murrah buffaloes. Whereas, Shiralkar and Dave (1975) found significant variation in total milking time due to different milkers in Kankrej cows.

**Milk Yield/Milking**

The overall mean milk yield/cow/milking was observed to be 3.32±0.11 kg (Table 1). This was higher than that observed in Sahiwal cows (2.86 kg; Ludri et al., 1982). However, higher milk yield/cow/milking was reported in Kankrej cows (4.08 kg) by Chauhan (2004). The overall average milk yield/cow/milking was 3.46±0.13 and 3.17±0.09 kg during morning and evening milking, respectively. It was higher at the morning milking than at the evening milking for all the months. The variation observed in milk yield/ cow/milking at morning and evening shift of milking was significant in the months of August, October, November and December. However, non-significant differences were observed in the months of September and January. The variation in overall milk yield/cow/milking due to shift of milking was also non-significant. Similar findings have been reported earlier by Chhikara et al. (1993) and Chauhan (2004) in Murrah buffaloes and Kankrej cows, respectively. However, Ludri et al. (1982) observed significant variation in milk yield due to shift of milking in Sahiwal cows. The average milk yield per cow per milking was the highest in the month of August (4.25 kg) and the lowest in January (2.50 kg). The differences observed in average milk yield per cow per milking in different months were highly significant ($P<0.01$). There was a progressive decline in milk yield from the month of August to January. The cows at the beginning of the study were in initial stage of mid lactation. With the advancement of experimental period, the lactation has also advanced and the cows from the mid lactation, entered in late lactation. This might be the reason for the progressive decline in milk yield with the advancement of experiment. Similar results have been reported by Chauhan (2004) in Kankrej cows. Significantly ($P<0.01$) higher milk yield was observed in hot-humid season (4.02 kg) as compared to in cold-dry season (2.97 kg; Table 2). During hot-humid season the cows were in mid lactation, while during cold-dry season, they were in late lactation. Thus, a confounding effect of stage of lactation might be the cause for seasonal variation noticed in average milk yield. These results are in agreement with earlier studies on Egyptian buffaloes by Al-Hassan et al. (1979) and on Kankrej cows by Chauhan (2004).

**Milk Flow Rate**

Average milk flow rate estimated in Kankrej cows was 0.77±0.01 kg/min (Table 1). This was higher than that (0.60 kg/min) reported in Sahiwal cows (Singh and Tomar, 1994). and lower than 0.97 kg/ min reported in Kankrej cows (Chauhan, 2004). Overall milk flow rate was found to be 0.74±0.1 kg/ min during morning milking and 0.79±0.01 kg/min during evening milking. The difference was statistically significant ($P<0.05$). Similar significant variation in milk flow rate due to shift of milking was also observed by Tripathi et al. (1991) and Singh and Tomar (1994) in indigenous cows. The highest milk flow rate was observed in the month of September (0.80 kg/min) and the lowest in October (0.74 kg/min). The differences in milk flow rate observed in different months were statistically non-significant. However, Chauhan (2004) observed significant variation in milk flow rate due to months in Kankrej cows.

Table 1: Average let down time, total milking time, milk yield/milking and milk flow rate during morning and evening milkings in different months in Kankrej cows

| Month | Let down time (seconds) | | Total milking time (seconds) | | Milk yield (kg/milking) | | Milk flow rate (kg/minute) | |
|---|---|---|---|---|---|---|---|---|
| | Morning | Evening | Morning | Evening | Morning | Evening | Morning | Evening |
| August | 81.57±1.43 | 77.38±1.24 | 348.13±12.68 | 312.94±4.93 | 4.40±0.11 | 4.10±0.05 | 0.76±0.01 | 0.75±0.03 |
| September | 76.10±3.50 | 71.60±4.22 | 315.15±9.37 | 294.23±13.46 | 3.90±0.13 | 3.65±0.12 | 0.79±0.01 | 0.81±0.09 |
| October | 69.10±0.97 | 66.42±0.95 | 322.44±2.74 | 278.18±4.81 | 3.70±0.08 | 3.40±0.07 | 0.74±0.02 | 0.74±0.03 |
| November | 66.11±1.22 | 62.50±1.22 | 267.76±11.56 | 224.00±9.19 | 3.35±0.09 | 3.00±0.06 | 0.75±0.01 | 0.78±0.04 |
| December | 61.52±1.05 | 56.75±4.00 | 230.43±6.01 | 193.10±3.21 | 2.85±0.05 | 2.50±0.07 | 0.69±0.01 | 0.80±0.07 |
| January | 65.17±3.47 | 61.73±3.26 | 193.31±3.44 | 169.96±5.61 | 2.60±0.14 | 2.40±0.11 | 073±0.02 | 0.85±0.05 |
| Overall | 69.93±1.94 | 66.06±2.84 | 279.53±11.77 | 245.40±11.18 | 3.46±0.13 | 3.17±0.09 | 0.74±0.1 | 0.79±0.01 |
| Pooled | 67.99 | | 262.67 | | 3.32 | | 0.77 | |

**Table 2: Average let down time, total milking time, milk yield/milking and milk flow rate in Kankrej cows during different seasons**

| Seasons | Let down time (seconds) | Total milking time (seconds) | Milk yield (kg/milking) | Milk flow rate (kg/minute) |
|---|---|---|---|---|
| Hot humid | 76.66±1.55[a] | 317.61±7.26[a] | 4.02±0.09[a] | 0.78±0.01 |
| Cold dry | 63.36±0.98[b] | 234.90±9.18[b] | 2.97±0.08[b] | 0.76±0.02 |
| Overall | 67.99±1.69 | 262.67±8.56 | 3.32±0.11 | 0.77±0.01 |

Means with different superscripts within the column differ significantly (P<0.01).

**Table 3: Average let down time, total milking time and milk flow rate in Kankrej cows milked by different milkers**

| Milker | Let down time (seconds) | Total milking time (seconds) | Milk flow rate (kg/minute) |
|---|---|---|---|
| Milker-A | 69.11±5.68 | 263.09±17.45 | 0.74±0.01 |
| Milker-B | 67.54±4.56 | 252.78±16.26 | 0.76±0.01 |
| Milker-C | 67.47±6.24 | 263.43±16.13 | 0.76±0.01 |
| Milker-D | 67.87±6.84 | 270.58±16.01 | 0.80±0.02 |
| Overall | 67.99 | 262.67 | 0.77 |

The average milk flow rate observed during hot-humid and cold-dry seasons is shown in Table 2. In hot-humid season milk flow rate was found to be 0.78±0.01 kg/min, whereas in cold-dry it was 0.76±0.02 kg/ min. The difference due to seasons was statistically non-significant. Milk flow rate indirectly represents the efficiency of milkers. Almost similar values of milk flow rate in two seasons indicated that the efficiency of milkers used in present investigation remained same in both the seasons. However, Chauhan (2004) observed significant variation in milk flow rate due to seasons in Kankrej cows. The average milk flow rate in Kankrej cows milked by four different milkers during the study is shown in Table 3. Maximum milk flow rate (0.80 kg/min) was recorded in the cows milked by Milker-D and the minimum (0.74 kg/min) in the cows milked by milker-A. However, the differences in milk flow rate due to different milkers were statistically non-significant.

**Association Between Milkability Traits**

Milk let down time was significantly and positively correlated with total milking time (r - 0.758). Similar association between milk let down time and total milking time has been reported in crossbred cows by Singh and Tomar (1994). Both let down time (r = 0.844) and total milking time (r = 0.963) showed highly significant and positive correlation with milk yield, which indicated that high yielders required more time for milking.

Similar association between total milking time and milk yield has been recorded previously by Chhikara et al. (1993) and Aulakh and Gupta (1994) in Murrah buffaloes and crossbred cows, respectively. However, milk flow rate was negatively correlated with milking time (r - -0.570) indicating that the higher the milk flow rate, lesser is the total milking time.

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