



ISSN: 2456-2912

VET 2024; SP-9(1): 621-624

© 2024 VET

www.veterinarypaper.com

Received: 19-10-2023

Accepted: 22-11-2023

Naveen Kumar P

Department of LPM, Veterinary
College Bengaluru, Karnataka,
India

Vivek M Patil

Department of LPM, Veterinary
College Bengaluru, Karnataka,
India

Mahadevappa D Gouri

Department of LFC, Veterinary
College Gadag, Karnataka, India

Guruprasad R

Department of LPM, Veterinary
College Hassan, Karnataka,
India

Madhusudhan HS

Department of ANN, Veterinary
College Bengaluru, Karnataka,
India

Shivaraj BM

SRDDL, IAHVB, Bengaluru,
Karnataka, India

Corresponding Author:

Vivek M Patil

Department of LPM, Veterinary
College Bengaluru, Karnataka,
India

Comparison of the milking efficiency under hand milking and community machine milking systems

Naveen Kumar P, Vivek M Patil, Mahadevappa D Gouri, Guruprasad R, Madhusudhan HS and Shivaraj BM

Abstract

The present study was carried out to evaluate two milking methods—hand milking system (HMS) and community machine milking system (CMS) in the jurisdiction of the Kolar-Chikkaballapura Milk Union Ltd. In order to compare the efficiency of different milking systems, 3 villages having functioning community milking stations were randomly selected from each district, giving a total of 6 villages. In each village, 12 dairy farmers, 6 using hand milking system and 6 using community milking system, were randomly selected. The milking efficiency of 216 lactating cows belonging to the respondents was studied. The mean Milk Let-down Time (sec) was lower in HMS (61.14 ± 0.699) as compared to CMS (86.29 ± 1.008), primarily due to feeding mixture of concentrate during milking. CMS had lower Milking Time (min) (4.91 ± 0.079), higher Milk Yield (kg) (6.82 ± 0.116), higher Milk Flow Rate (kg/min) (1.39 ± 0.011), possibly due to better milk ejection mechanism in milking machine, due to high vacuum pressure and regular pulsation rate, as compared to HMS (10.08 ± 0.162 , 6.15 ± 0.110 and 0.61 ± 0.008 , respectively). Based on the findings of the present study, it can be concluded that Community Machine Milking System is an innovative solution to reduce labour requirement for milking at small dairy farms.

Keywords: Community machine milking, hand milking, milking efficiency, Karnataka

Introduction

Milking is considered as one of the most important activities at a dairy farm. The milking performance, milking behaviour, udder health and milk quality are all greatly affected by the method of milking. The quality of milk produced has a direct bearing on the profitability of a farm. Further, milking is a time-consuming exercise which requires lot of manpower and energy. Milking operation is the major activity of every dairy farm affecting the quantity, quality and the cost of the milk produced. Good milking practices also enhance productivity, assist in keeping teat and udder in healthier condition and contribute significantly in clean milk production (Sabapara *et al.*, 2015) [9]. Hand milking is the common milking method in our country, with almost 90 per cent of dairy animals being milked by hand. It has been reported that milking is a labour-intensive task and requires over half of the annual labour inputs on well-managed dairy farms (Taylor *et al.*, 2009) [12]. Out of total time spent on various operations, milking operation alone takes more than half of the man-minutes/animal/day (Sreedhar and Ranganadham, 2009) [11]. The labour required for milk harvest may account for as much as 80% of annual milking costs and over 50% of routine operational requirements on a dairy farm.

The Kolar-Chikkaballapura District Co-operative Milk Producers' Union Ltd. (KOMUL) has started installing 'Bulk Milk Coolers' and 'Community Milking Machines' on a pilot basis at the Society level from the year 2001 onwards to get the quality milk required for ultra-high temperature (UHT) milk processing at Kolar dairy under the brand name of 'Nandini Good Life'. Among these CMP initiatives, noteworthy initiative is the setting up of Community Milking Parlours in some of the Milk Producers' Cooperative Societies (MPCS) on pilot basis (Mohan Kumar *et al.*, 2015) [3].

With the ever-increasing cost of agricultural labour, it has become imperative to mechanize various aspects of dairy farming; the most important being hand-milking operations which involve the most skill and drudgery.

Small-scale alternatives to hand-milking, though popular, have associated drawbacks in the form of purchase cost of milking machine, time and money required for daily and periodic maintenance, irregular supply of spares, lack of timely repair in case of breakdown, investment in backup power systems, high operating costs etc. This dissuades dairy farmers from expanding the herd beyond 1-2 animals. The innovative approach of using community milking machines can serve as a valuable method of promoting dairy farming and exploiting its full potential, especially among small farmers; while also providing pure and high quality, low bacterial-load milk to consumers. This study aims to compare the two milking systems – hand milking and community machine milking, in terms of their milking efficiency in order to ascertain the merits and demerits of each system.

Materials and Methods

The study was carried out in the jurisdiction of the Kolar-Chikkaballapura Milk Union Ltd. (KOMUL), Karnataka during July-August 2022. Kolar District is situated at 13.1770°N Longitude, 78.2020°E Latitude, at an altitude of 849 metres (2,785 ft) above the mean sea level, and Chikkaballapura District is situated at 13.5229° N Longitude, 77.8367° E Latitude, at an altitude of 915 m (3,002 ft) above the mean sea level. Kolar and Chikkaballapura districts consist of 119 and 56 community milking machine parlours, respectively, comprising either 4, 6, 8 or 10 bucket units (DeLaval). In order to compare the efficiency of different milking systems, 3 villages having functioning community milking stations were randomly selected from each district, giving a total of 6 villages. In each village, 12 dairy farmers, 6 using hand milking system and 6 using community milking system, were randomly selected for the study. A total of 216 HF crossbred cows were evaluated. Parameters studied were milk let down time, milking time, milk yield and milk flow rate.



Fig: Community machine milking system

Results and Discussion

Milk Let-Down Time (MLT)

The data on mean milk let-down time (sec) in 216 crossbred cows under different milking systems and districts is presented in Table 1. The mean MLT (sec) in hand milking and community machine milking systems was 61.14±0.699 and 86.29±1.008, respectively with overall mean of 73.71±1.053. HMS had significantly ($p<0.01$) lower MLT than CMS. There was no significant ($p<0.05$) difference in the overall MLT (sec) in Chikkaballapura (74.40±1.538) and Kolar (73.03±1.444) districts. Further, there were no significant ($p<0.05$) differences between Chikkaballapura and Kolar districts with regard to the MLT in HMS and CMS.

However, within each district, MLT was significantly ($p<0.01$) lower in HMS as compared to CMS.

The results are in agreement with Ritu (2019)^[8] who observed that MLT was significantly higher ($p<0.05$) in the cows milked under herringbone milking system (93.72±2.78 s) in comparison to pipeline system (85.60±2.07 s) and hand milking method (84.68±2.10 s). However, Singh *et al.* (2014) found that the MLT time was not significantly different between hand and machine milked buffaloes (5.36±0.21 vs 5.82±0.29 min). Decrease in milk let-down time in hand milking is most likely due to feeding of concentrate mixture during milking, which is known to be a potent stimulus for milk ejaculation and stimulation. In addition, manual pre-stimulation along with concentrate feeding at the time of milking resulted in faster release of oxytocin and prolactin as compared to milking only with manual pre-stimulation (Ritu, 2019)^[8].

Milking Time (MT)

The data on mean milking time (min) in 216 crossbred cows under different milking systems and districts is presented in Table 2. The mean MT (min) in hand milking and community machine milking systems was 10.08±0.162 and 4.91±0.079, respectively with overall mean of 7.50±0.198. CMS had significantly ($p<0.01$) lower MT than HMS. There was no significant ($p<0.05$) difference in the overall MT (min) in Chikkaballapura (7.40±0.284) and Kolar (7.60±0.277) districts. Further, there were no significant ($p<0.05$) differences between Chikkaballapura and Kolar districts with regard to the MT in HMS and CMS. However, within each district, MT was significantly ($p<0.01$) lower in CMS as compared to HMS.

The results are in agreement with Filipovic and Kokaj (2009)^[2] who observed that the MT was significantly ($p<0.05$) shorter using machine milking as compared to hand milking (4.42 vs 6.05 min) respectively. Prasad and Jaya Laxmi (2014) found that the MT was 5.32±0.09 and 5.60±0.08 min in machine and hand milking, respectively, difference being significant ($p<0.05$). However, Patel *et al.* (2016)^[5, 6] reported non-significant difference in MT of Sahiwal cows under machine milking (363.05±14.05 s) and hand milking (369.37±12.00 s). The lower MT recorded in community machine milking system in comparison to hand milking system may be due to higher vacuum pressure and more regular and higher pulsation rate which helps in maintaining high rate of milk flow.

Milk Yield (MY)

The data on mean milk yield (kg) in 216 crossbred cows under different milking systems and districts is presented in Table 3. The mean MY (kg) in hand milking and community machine milking systems was 6.15±0.110 and 6.82±0.116, respectively with overall mean of 6.48±0.083. CMS had significantly ($p<0.01$) higher MY than HMS. There was no significant ($p<0.05$) difference in the overall MY (kg) in Chikkaballapura (6.33±0.123) and Kolar (6.63±0.111) districts. While there was no significant ($p<0.05$) difference with regard to MY in HMS among the districts, Kolar district had significantly ($p<0.05$) higher MY under CMS. Further, though there were no significant ($p<0.05$) differences with regard to milking system in Chikkaballapura district, CMS had significantly ($p<0.01$) higher MY in Kolar district.

The results are in agreement with Barot *et al.* (2021)^[1] who reported overall MY to be significantly ($p<0.01$) higher in machine milked cows (8.81±0.08 kg) as compared to hand

milked cows (7.65±0.05 kg). Filipovic and Kokaj (2009) [12] concluded that the average MY per milking was significantly higher ($p<0.05$) in machine milking (5.06 kg) as compared to hand milking (3.69 kg). The difference in MY may be due to better stimulation as well as efficient and complete removal of milk in machine milking as compared to hand milking.

Milk Flow Rate (MFR)

The data on Milk Flow Rate (kg/min) in 216 crossbred cows under different milking systems and districts is presented in Table 4. The mean MFR (kg/min) in hand milking and community machine milking systems was 0.61±0.008 and 1.39±0.011, respectively with overall mean of 1.00±0.027. CMS had significantly ($p<0.01$) higher MFR than HMS. There was no significant ($p<0.05$) difference in the overall MFR (kg/min) in Chikkaballapura (0.99±0.037) and Kolar (1.01±0.04) districts. While there was no significant ($p<0.05$)

difference with regard to MFR in HMS among the districts, Kolar district had significantly ($p<0.05$) higher MFR under CMS. Further, CMS had significantly ($p<0.01$) higher MFR than HMS in Chikkaballapura and Kolar district.

The results are in agreement with Barot *et al.* (2021) [1] who reported that overall MFR was significantly ($p<0.01$) higher in machine milked cows (2.47±0.02 kg/min) as compared to hand milked cows (1.49±0.02 kg/min). Omar *et al.* (2005) [13] reported that MFR under machine milking (2.34±0.30) was significantly ($p<0.05$) higher as compared to hand milking (1.888±0.262). In contrast, Patel *et al.* (2016) [5, 6] reported that MFR was significantly ($p<0.05$) higher in hand milking (695.68±67.84 g/min) as compared to machine milking (624.65±5.76 g/min) in buffaloes. The higher mean MFR in milking machine may be due to maintenance of higher vacuum pressure throughout milking in contrast with hand milking.

Table 1: Comparison of Milk Let-down Time (sec) in crossbred cows under hand milking and community machine milking systems in different districts of Karnataka.

Milking System	District		Overall	P-value
	Chikkaballapura	Kolar		
Hand	61.52±1.032 ^a	60.76±0.951 ^a	61.14±0.699 ^a	0.589
Community Machine	87.28±1.493 ^b	85.3±1.355 ^b	86.29±1.008 ^b	0.328
Overall	74.40±1.538	73.03±1.444	73.71±1.053	0.649
P-value	0.000	0.000	0.000	

Note: Means within a column having different superscripts differ significantly ($p<0.05$).

There were no significant differences among any of the row-wise means.

Table 2: Comparison of Milking Time (min) in crossbred cows under hand milking and community machine milking systems in different districts of Karnataka.

Milking System	District		Overall	P-value
	Chikkaballapura	Kolar		
Hand	9.57±0.245 ^a	10.19±0.214 ^a	10.08±0.162 ^a	0.510
Community Machine	4.52±0.120 ^b	5.01±0.102 ^b	4.91±0.079 ^b	0.228
Overall	7.40±0.284	7.60±0.277	7.50±0.198	0.719
P-value	0.000	0.000	0.000	

Note: Means within a column having different superscripts differ significantly ($p<0.05$).

There were no significant differences among any of the row-wise means.

Table 3: Comparison of Milk Yield (kg) in crossbred cows under hand milking and community machine milking systems in different districts of Karnataka.

Milking System	District		Overall	P-value
	Chikkaballapura	Kolar		
Hand	6.11±0.170 ^{aX}	6.19±0.143 ^{aX}	6.15±0.110 ^a	0.726
Community machine	6.56±0.173 ^{bX}	7.07±0.147 ^{bY}	6.82±0.116 ^b	0.026
Overall	6.33±0.123	6.63±0.111	6.48±0.083	0.210
P-value	0.065	0.000	0.004	

Note: Means within a column (^{ab}) or row (^{XY}) having different superscripts differ significantly ($p<0.05$).

Table 4: Comparison of Milk Flow Rate (kg/min) in crossbred cows under hand milking and community machine milking systems in different districts of Karnataka.

Milking System	District		Overall	P-value
	Chikkaballapura	Kolar		
Hand	0.62±0.014 ^{aX}	0.61±0.009 ^{aX}	0.61±0.008 ^a	0.628
Community machine	1.36±0.015 ^{bX}	1.42±0.015 ^{bY}	1.39±0.011 ^b	0.014
Overall	0.99±0.037	1.01±0.04	1.00±0.027	0.774
P-value	0.000	0.000	0.000	

Note: Means within a column (^{ab}) or row (^{XY}) having different superscripts differ significantly ($p<0.05$).

Conclusion

Based on the findings of the present study, it can be concluded that Community Machine Milking System is an innovative solution to reduce labour requirement for milking at small dairy farms and preventing adulteration of milk. While CMS had substantially better milk yield, milk flow rate

and milking time as compared to HMS, some adverse effects like higher milk let-down time can be reduced by concentrate feeding at the time of milking.

References

1. Brijal BC, Patel N, Rani DV, Rao TKS, Baishya A. Effect of milking system on production performance and milking behavioral traits in HF crossbred cattle. *Pharma Innov.* 2021;10(12):719-723.
2. Filipovic D, Kokaj M. The comparison of hand and machine milking on small family dairy farms in central Croatia. *Livest. Res. Rural. Dev.* 2009;21(5):4.
3. Mohankumar S, Satyanarayan K, Jagadeeswary V, Manjunatha L. A comparative study of bacterial load under individual and community milking system in Kolar district of Karnataka. *Asian J Dairy & Food Res.* 2015;35(3):206-209.
4. Badawi OE, Ahmed AK. Comparative study of machine and hand milking under Sudanese condition; c2005.
5. Patel B, Pathak PK, Kumar N, Lathwal SS, Prasad S. Comparative study on milking ability of Sahiwal cows and murrah buffaloes under hand and machine milking. *Int. J Sci. Environ. Technol.* 2016;5(6):4081-4085.
6. Patel B, Pathak PK, Kumar N, Lathwal SS, Prasad S. Comparative study on milking ability of Sahiwal cows and murrah buffaloes under hand and machine milking. *Int. J Sci. Environ. Technol.* 2016;5(6):4081-4085.
7. Prasad RMV, Jaya Laxmi P. Milk yield and milk flow traits in Murrah buffaloes as influenced by method of milking. *Int. J Agric. Sci & Vet. Med.* 2014;2:111-115.
8. Ritu. Studies on milking behavior, performance and milk quality of Sahiwal cows milked under pipeline type and automatic machine system, Master's thesis, National Dairy Research Institute, Karnal, India; c2019.
9. Sabapara GP, Fulsoundar AB, Kharadi VB. Milking and health care management practices followed by dairy animal owners in rural areas of Surat district. *J Agric. Vet. Sci.* 2015;2(2):112-117.
10. Singh M, Prakash BS, Mallick S. Hormone release, milk production and composition in Murrah buffaloes milked by hand and machine. *Indian J Anim. Res.* 2014;48(5):444-447.
11. Sreedhar S, Ranganadham M. Labour utilization pattern in management of various categories of dairy animals. *Indian J Anim. Res.* 2009;43(3):187-190.
12. Taylor G, Van der Sande L, Douglas R. Technical report for smarter not harder: Improving labour productivity in the primary sector, A Joint Dairy Insight and Sustainable Farming Fund Project; c2009.
13. Abu-Omar MM, Loaiza A, Hontzeas N. Reaction mechanisms of mononuclear non-heme iron oxygenases. *Chemical reviews.* 2005 Jun 8;105(6):2227-2252.