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Evaluation of Surf Field Test and California Mastitis Test for Diagnosis of Sub Clinical Mastitis in Crossbred Cows

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ABSTRACT

A total of 200 quarter milk samples from 50 crossbred dairy cows were subjected to California mastitis test (CMT) and surf field mastitis (SFMT) test to evaluate the efficacy of 3% solution of household detergent *viz.,* Surf Excel in detecting sub clinical mastitis in Malnad areas of Karnataka. During screening around 5.5 per cent of teats were found to be blocked/obstructed and were not considered for screening of sub clinical mastitis. Results showed that 32.32 per cent (61/189) and 28.63 per cent (54/189) prevalence of SCM in cows after detection with CMT and SFMT, respectively. The quarter prevalence rates were higher for the hind quarters (33.57%) compared to fore quarters (27.40%) in both tests. Further, the overall incidence was higher in left hind quarter (35.87%) followed by right hind quarter (31.92%), left fore quarter (29.17%) and right fore quarter (25.00%) for both tests. The study concludes that the closely similar diagnostic efficiency of SFMT to CMT together with inexpensive and ready availability of SFMT reagent and suggest that SFMT can be used as a cheaper, user-friendly alternative animal-side subclinical mastitis diagnostic test in rural areas.

Key Words: California , Cross bred cattle, Mastitis, Surf, Teat.

INTRODUCTION

Mastitis is one of the most important health problems of the dairy animals (Getahun *et al*, 2008) in India and other developing countries. Mastitis is seen in all type of animals and it not only reduces milk yield but also induces undesirable compositional changes which are detrimental to variety of dairy products (Fetrow *et a,l* 2000; Heeschen, 2005). It has two forms *viz.,* clinical and subclinical (hidden epidemic of mastitis). Owing to overt manifestations of clinical signs (inflamed udder, visible changes in milk, etc) diagnosis of clinical form is pretty straight forward for dairy farmers and veterinarians. Contrarily, the subclinical mastitis is devoid of such overt manifestations and therefore, its diagnosis is a challenge in dairy animal management and in veterinary practice. The early diagnosis of subclinical mastitis is very important as it is more prevalent than its clinical counterpart and causes greater economic losses to the farmer (Almaw *et al*, 2008; George *et al*, 2008). Further, the subclinical intra-mammary infections are often leads to clinical mastitis if the condition not treated at early stage (Muhammad *et al*, 1995). The successful treatment of mastitis is often depends on duration of intramammary infections and kind of bacteria's involved (Owens *et al*, 1997; Erskine *et al*, 2003). Subclinical mastitis can be detected by bacteriological examination, somatic cells count (considered as gold standards) and California mastitis test (CMT). Among them, first two tests are not widely applicable in developing countries but an animal-side mastitis detection test called California mastitis test (CMT) is used to detect subclinical mastitis. The reagent (sodium alkyl aryl sulfonate) of this test is not readily available in many parts of the country and it is somewhat costly to the farmers who can't offer.

Further, now a day's Surf field mastitis test (SFMT) is new test developed which is being used

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in many parts of the country for detection of sub clinical mastitis. Ideally this test is user's friendly and 3% solution of a readily available household detergent *viz.,* Surf Excel is used (Muhammad *et al,* 1995). Further, the sensitivity and specificity of this test has been studied by many authors (Muhammad *et al,* 2009). However, the effectiveness of this test compared to California mastitis test in terms of efficacy and economics has not been studied in the cows reared in malnad areas of Karnataka. Hence, the present study was designed to determine effectiveness of SFMT vis-à-vis CMT.

MATERIALS AND METHODS

Collection of milk samples, their handling and on-site mastitis screening tests:

A total of 50 cows (Jersey and HF cross) of Sirsi Taluka aged between 5-10 yr were selected for the study as a part of method demonstration. Most of the animals were stall fed and few were kept on grazing. All the animals were hand milked and standard mastitis control practices (pre and post milking antiseptic teat) were not practiced regularly. Further, the information on age, lactation stage and previous history of mastitis was collected with the consent of farmer.

Milk sampling

200 Quarter fore-milk samples were collected aseptically for assay as described by Haltia and Honkanen-Buzalski *et al* (2006). Prior to the collection of milk samples, the udder was washed with water and dried with paper towel. Teat ends were disinfected with cotton swabs soaked in 70% ethanol and allowed to dry. The first streams of milk were discarded. Milk samples of the respective quarters of an animal were collected in sterile 15 ml tubes and properly marked with number of animal and position of quarter. The milk samples were then transported in an ice box to the laboratory for further testing and analysis.

Physical examination of milk sample

Immediately after collection, milk samples were subjected to physical examination with naked eyes to detect any abnormalities in colour, odour, consistency and presence of clot, blood, flakes and any other visible abnormalities (Muhammad Shahid *et al,* 2011).

Screening Tests

Surf Field Mastitis Test (SFMT)

The principle of the test is that when detergent is added into milk sample, it causes rupture of somatic cells and which results in releases of DNA and other cell contents. DNA is acidic in nature, while detergent contains alkyl-arylsulfonate, which is basic in nature. Combination of DNA and detergent results in the formation of a gel. Consistency of gel depends upon the number of somatic cells. Higher the number of cells, thicker gel formation and vice-versa.

Procedure

3 per cent surf solution (pH = 10.3) was prepared by dissolving 3 g of commonly available Surf Excel (Uniliver, India) in 100 ml of Distilled water. This test solution is stable for six months at room temperature. Equal quantity of 3% reagent and milk were mixed in a sterile conical flask. The mixture is swirled for about 1 minute and then poured into a petri plate. After a few seconds, visual examination for the presence of floccules or gel formation indicated the positive results for intra mammary infection. While the absence of any floccules or gel formation in the sample was considered as negative for intra mammary infection (Muhammad *et al,* 1995).

The changes in consistency of milk indicated mastitis, while no change in consistency of milk indicated healthy samples. The mastitis was graded into further four categories based on the severity of disease from lower to higher intensity as, +(moderate), ++(severe), +++(more severe), ++++(very severe) (Muhammad *et al,* 1995). The percentage of prevalence was calculated by using the following formula as-

Prevalence (%) = No. of samples positive /No. of samples tested x 100

California Mastitis Test (CMT)

The other on-site test CMT was performed as per Schalm *et al* (1971). After complete milking, clinical examination of udder and teats was performed (Klaas *et al,* 2004).

Results and Discussion:

The percent animals affected with blind teats has been depicted in the table 1. During screening around 5.5% of teats were found to be blocked/ obstrudted and were not considered for screening of sub clinical mastitis. However, the prevalence was higher in left hind followed by right hind teat which was in agreement with study conducted by Udayakamari *et al* (2020). Abd-El-Hady *et al* (2015) reported higher prevalence of teat obstruction in cattle (19.4%) compared to present study. However, Ragab *et al* (2017) reported lower incidence (0.66%) compared to our study. The difference in the percent incidence may be attributed to variation in the breed, climate, area and stage of lactations. The acquired lesion was mainly traumatic in origin as faulty milking process, untrimmed claws, long medial dew claws or being trotted on by the cow itself or by their neighbor animal. These traumas could result in a complete obstruction of the teat end or incontinentia lactis (Free milkers). Furthermore, ignorant interference and unprofessional treatment in the cases of teat stenosis may aggravate the condition.

Test evaluation based on diagnostic comparison of SFMT and CMT for detection of subclinical mastitis in cows has been depicted in Table 2. Results showed 32.33 per cent (61/189) and 28.64 per cent (54/189) prevalence of SCM in cows after detection with CMT and SFMT, respectively and overall incidence was 30.49 per cent. Further, the studies conducted by Banger *et al* (2014) and Mourya, (2020) are in agreement with our studies. However, Pankaj *et al* (2012) reported higher incidence of SCM compared to our study. Similarly, Ranjeet *et al* (2018) showed higher incidence (44%) of SCM detected with SFMT compared to our study. The probable variation may be attributed to breed, climate, area and stage of lactations. In present study, SFMT and CMT had nearly similar significance in detection of SCM. However, CMT has shown higher positivity rate compared to SFMT, but the difference was non-significant. Karabasanavar *et al* (2021) reported that both CMT and SFMT tests performed equally in the detection of SCM as measured by analytical accuracy (84.72%). Further, in comparison to somatic cell count (SCC), SFMT showed higher diagnostic sensitivity of 94.74 per cent than the CMT 73.68 per cent; specificity of CMT was higher (97.06%) than the SFMT (73.53%). Further, Muhammad *et al* (2010) reported SFMT was significantly ($p<0.05$) more sensitive and was comparable with CMT in both cattle and buffaloes. Results of the both study indicated practical applications of SFMT for the detection of SCM owing to accessibility and ease of doing SFMT and its diagnostic capabilities in comparison to the widely accepted CMT. Keeping in view, the economic significance of SCM among crossbred dairy cows and need for its early diagnosis at the field level; findings of this study recommend popularization of SFMT among dairy farmers so as to control SCM in time and avoid associated economic losses to the dairy farmers.

Percent incidence of SCM in fore quarter and hind quarter has been depicted in Table 3 and Fig 1. Milk samples detected with CMT and SFMT showed higher incidence of sub clinical mastitis in hind quarter (35.16%; 31.98%) compared to fore quarter (29.50%; 25.29%) respectively. Further, results for CMT were higher for left hind (LH) quarter 36.96% (17/46) followed by right hind (RH) quarter 34.04% (16/47), left fore quarter (LF) 31.25% (15/48) and right fore (RF) quarter 27.08% (13/48). Further, Similar trends were observed when SCM was detected by SFMT.

Likewise, Ranjeet *et al* (2018) showed that, among the infected quarters, 19.0 per cent were right fore, 25 per cent right hind, 18 per cent left fore and 38 per cent left hind quarter which is in agreement

Table 1: Percent of blind teats in different quarters

Quarters	Blind Teats	
	Positive	Percentage
RF (50)	2	18.18
RH (50)	3	27.27
LF (50)	2	18.18
LH (50)	4	36.36
Overall	11 (5.5%)	

Table 2: Percent incidence of sub clinical mastitis detected with CMT and SFMT in different quarters

Quarters	CMT		SFMT		Overall percentage
	Positive	Percentage	Positive	Percentage	
RF (48)	13	27.08	11	22.92	25.00
RH (47)	16	34.04	14	29.79	31.92
LF (48)	15	31.25	13	27.08	29.17
LH (46)	17	36.96	16	34.78	35.87
Total	61	32.33	54	28.64	30.49

with our study. Likewise, mean value of sub-clinical mastitis was higher (31.5%) in hindquarters of cows in comparison to (18.5%) in fore-quarters which is also in agreement with our study. Further, In present study, among hindquarters, left hindquarters were found to be slightly more susceptible and among fore quarter left fore-quarter found to be more susceptible as also reported by Saini *et al* (1994) and Ranjeet *et al* (2018). Contrary, Mourya (2020) and Maheshwari *et al* (2016) reported higher higher prevalence in forequarters (20.73%) as compared to hind quarters of 19.63 per cent compared to our study. However, the difference in prevalence rates were minor and the probable variation could be to changes in management practices, feeding schedule, breed and location. Milking practices adopted by milkman and the high chance of getting faecal and environmental contamination (Bansal *et al,* 1995) furthermore, the high production capacity of hind quarters could be attributed to these findings (Radostits *et al,* 2010).

Further, the overall incidence of sub-clinical mastitis was found to be highest in the early stage of lactation (52.53%) followed by mid (28.53%) and late stage of lactations (18.94%) (Table 4 and Fig 2). Further, the percent positivity for both tests was almost similar during different stage of lactation in cows. Similarly, Ranjeet *et al* (2018) also reported higher Incidence of sub-clinical mastitis in the early stage of lactation (52%) followed by mid (31%) and late stage of lactations (17%) which was in agreement with our study. Islam *et al* (2011), Maheshwari *et al* (2016) and Mourya *et al* (2020) also reported highest prevalence of SCM during the early lactation stage as 30.0 per cent and 47.46 per cent, 56.25 per cent respectively. Negative energy balance and post partum rapid physiological change in the mammary tissue causes low / reduced udder resistance and higher prevalence of SCM.

CONCLUSION

Bovine mastitis is an escalating hindrance to the upcoming dairy industry in agro-pastoral areas and requires urgent measures, SCM is possibly confounded by poor performance of local breeds and poor feeding management. The results of the both study indicated practical applications

Table 3: Percent incidence of sub clinical mastitis detected with CMT and SFMT in Fore and Hind quarters

Quarters	CMT		SFMT		Overall percentage
	Positive	Percentage	Positive	Percentage	
Fore quarter (94)	28	29.50	24	25.29	27.40
Hind Quarter (95)	33	35.16	30	31.98	33.57
Total	61	32.33	54	28.64	30.48

Table 4: Mastitis Incidence in cows in different stage of lactation

Sl. No	Stage of Lactation	% Mastitis Incidence (CMT)	% Mastitis Incidence (SFMT)	Overall Mastitis Incidence
1	Early	53.20 (33)	53.70 (29)	52.53
2	Mid	27.42 (17)	27.78 (15)	28.53
3	Late	19.36 (12)	18.52 (10)	18.94

of SFMT for the detection of SCM owing to accessibility and ease of doing SFMT and its diagnostic capabilities in comparison to the widely accepted CMT. Keeping in view, the economic significance of SCM among crossbred dairy cows and need for its early diagnosis at the field level. The findings of this study recommends popularization of SFMT among dairy farmers so as to control SCM in time and avoid associated economic losses to the dairy farmers.

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Demonstration of SFMT and CMT

Demonstration of milk sampling

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