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Effect of Dry Period Duration on Udder Health, Milk Production and Body Condition of Jersey Crossbred Cows at Lower Gangetic Tropics

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ABSTRACT

Background: Dry period duration of dairy cow is considered as an important factor to maintain udder health and milk production.

Methods: To investigate the effect of dry period duration (DPD) on udder health, milk production and body condition of dairy cows at lower Gangetic tropics, observations were taken from 25 Jersey crossbred cows which were divided into 2 comparable group *viz*: 1st group (11 cows), having 50 to 60 days DPD and 2nd group (14 cows), having more than 60 days DPD.

Result: Statistically analyzed data revealed that milk somatic cell count, MCMT, milk pH and EC were significantly ($P<0.01$) varied between two group from second month onwards and continue up to 4th months of lactation. Critical analysis of battery tests clearly confirmed the diagnosis for occurring of subclinical mastitis with poor udder health status in 2nd group. Total milk production/day/cow were almost similar in both group in first month but second month onwards significantly ($P<0.01$) higher milk production was recorded in 1st than 2nd group. The milk composition parameters revealed non-significant difference between groups whereas milk quality parameter significantly ($P<0.01$) better in 1st than 2nd group. Initial BCS of dry cow of both groups were similar. But BCS at calving was significantly ($P<0.05$) higher in 2nd than 1st group with higher negative changes in BCS % in 2nd group as compared to 1st group. It can be concluded that dry period duration of 50-60 days is better over to prolonged dry period (>60 days). Suitable changes in BCS from dry period to calving is beneficial to get higher milk production, quality, better maintenance of body condition and udder health status of Jersey crossbred cows at tropical lower Gangetic region.

Key words: BCS, Dry period duration, Jersey crossbred cows, Lower gangetic region, Milk production, Udder health.

INTRODUCTION

Maintenance of suitable dry period duration (DPD) of dairy cow is very important. Jersey crossbred cows of lower Gangetic tropics are susceptible to subclinical mastitis (SCM) which may hamper milk quantity, quality and overall body condition of cows. Most of farmers of this region keep their dairy cows in more than 60 days dry period but few farmers maintain 50-60 days dry period (Bhakat *et al*, 2019). Prolonged dry period may lead to over conditioning of dairy cows since there is no milk production in that particular stage. It had been noted that over-fattened cow at calving losses more body weight post-partum (Paul *et al*. 2019). Obtaining an optimum body condition score (BCS) during dry period and at calving may be beneficial to increase milk yield and udder health status. Therefore, present study was aimed to investigate the effect of dry period duration on udder health, milk production and body condition of Jersey crossbred cows at lower Gangetic tropics.

MATERIALS AND METHODS

This study was conducted on 25 Jersey crossbred cows having almost similar initial BCS and observed during dry period to calving and post-partum up to 4 months of lactation period. Animal's record (date of insemination, PD, drying-up *etc.*) were taken from Dairy Bikash Kendra of Eastern Regional Station-NDRI, institute's adopted village (Muratipur) of Nadia district, WB (lower Gangetic region of tropics), 2019-20. Based on different DPD animals were classified into 2 different comparable group (almost similar BCS), *viz*: 1st group (11 cows), having 50 to 60 days DPD and 2nd group (14 cows), having more than 60 days DPD. All animals were provided (similar feeding management practice) with a*d libitum* green and dry fodders during dry period and additional concentrate mixture (@3 kg/cow/day) during lactation period.

Observation of milk production (morning, evening) of all experimental animals were recorded at fortnight interval. Udder health status (sub-clinical mastitis) was detected by milk somatic cell count (SCC), modified California mastitis

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test (MCMT), electrical conductivity (EC) and pH. The MCMT was conducted as per procedure described by Pranay *et al*. (2015a). Milk composition parameters were analysed by estimating of fat, SNF, total solid by using automatic milk analyser (MILKOSCAN) and also cross checked manually.

Milk somatic cell count

It was carried out by an automatic machine of DeLaval cell counter DCC. For cross checking of SCC the microscopic procedure (Bhakat *et al*., 2017a) was also adapted by using microscopic method of somatic cell count with modified Newman's Lampert stain and were examined under oil immersion lens (100X).

Milk quality test

MBRT was done. Time of reduction was taken as a measure of number of organisms in the milk (Wathore and Bhakat, 2016).

Body condition score (BCS)

BCS of animals were assigned using visual plus palpation technique. This method grades the cow's conditioning status on a six-point scale (1-6). The score 1 reflects very thin and 6 reflects very fat animal (Paul *et al*, 2020). For assessing the body condition of animals, anatomical regions (critical points) were taken into account meticulously as standardized by Paul *et al*. (2019) for Jersey crossbred dairy cows of this region.

RESULTS AND DISCUSSION

Udder health status

The occurrence of SCM can adversely affect udder health status and finally lead to lower milk production. Statistically analyzed data (Table 1) revealed that Log_{10} Somatic cell count (SCC) was found almost similar during first month of lactation in both group but second month onwards significantly (P<0.01) lower SCC (cells/ml of milk) found in 1st than 2nd group and similar trend continue up to 4th months. Retransformation of Log_{10} SCC indicated that milk samples of cows of 1st group had normal somatic cell count which is usually required for udder self-defense mechanism whereas milk samples of cows of 2nd group had more than 200,000 somatic cell count which indicated the occurrence of subclinical mastitis where no visible health symptoms were found but milk production became gradually lesser and lesser as lactation period progressed. Since cows of 2nd group having prolonged DPD (>60 days), could not maintain optimum BCS at calving, so during post calving period higher negative energy balance (NEB) was found which might had led to impaired immune function and increased risk of inter-mammary infection (IMI) which ultimately resulted in higher somatic cell count in 2nd group. Findings of other workers (Singh *et al* 2020a) supports the results of present study which indicates that udder health problems were encountered in high BCS cows as compared to optimum BCS cows. Proper BCS cows showed significantly lower SCC. Paul and Bhakat (2018a) found that under BCS and over BCS at calving significantly (P<0.05) increased SCC in milk. Pranay *et al*. (2015b) reported that delay in post milking feeding time lead to IMI and SCM in Jersey crossbred cows. Bhakat *et al*. (2016) found that the Log_{10} SCC (cells / ml) were significantly (P<0.01) higher in IMI cows (6.55 ± 0.05) as compared to non-IMI Jersey crossbred cows (4.05 ± 0.04) at lower Gangetic tropic.

Analyzed data of MCMT (Table 1) revealed that almost similar grade was found during first month of lactation in both group but second month onwards significantly (P<0.01) lower MCMT found in 1st than 2nd group and similar trend continue up to 4th months. A comparison among months of lactation revealed that higher milk SCC and MCMT were found in first month with lowering trend in second month onwards in 1st group but an increasing trend in 2nd group. Pranay *et al*. (2017) reported that MCMT grade was higher in cows where post-milking fodder was available in late. Bhakat *et al*. (2017b) found that MCMT grade can be reduced in machine milking practices in Jersey crossbred cows at lower Gangetic region of tropic. Analyzed data of pH revealed that almost similar value during first month of lactation in both group but second month onwards significantly (P<0.01) lower pH found in 1st than 2nd group. During all 4 months, the 1st group milk samples had normal milk pH on the other hand 2nd group milk sample had higher pH. As per the findings of Pranay *et al* (2019) pH 6.69 or more was associated with subclinical mastitis milk. This might be due to presence of higher Na^+, K^+ ion and somatic cell count in milk sample of animals of 1st than 2nd group. Kumari *et al* (2020)

Table 1: Milk testing parameters for udder health/subclinical mastitis in Jersey crossbred cows in different dry period duration.

Months of lactation	1st Group	2nd Group
Log_{10} somatic cell count (cells / ml)		
1st Month	$5.75^a±0.09$	$5.71^a±0.08$
2nd Month	$5.26^a±0.07$	$5.74^b±0.09$
3rd Month	$5.10^a±0.08$	$5.80^b±0.05$
4th Month	$5.09^a±0.07$	$5.99^b±0.06$
Modified california mastitis test		
1st Month	$2.73^a±0.18$	$2.76^a±0.26$
2nd Month	$2.10^a±0.17$	$2.86^b±0.29$
3rd Month	$2.07^a±0.19$	$2.93^b±0.31$
4th Month	$1.64^a±0.15$	$3.21^b±0.38$
pH		
1st Month	$6.65^a±0.08$	$6.63^a±0.09$
2nd Month	$6.63^a±0.07$	$6.80^b±0.07$
3rd Month	$6.56^a±0.06$	$6.85^b±0.04$
4th Month	$6.59^a±0.05$	$6.91^b±0.06$
Electrical conductivity (mS/cm)		
1st Month	$4.59^a±0.09$	$4.61^a±0.08$
2nd Month	$4.29^a±0.04$	$5.82^b±0.07$
3rd Month	$4.48^a±0.08$	$5.12^b±0.06$
4th Month	$4.47^a±0.07$	$5.86^b±0.05$

Means with different superscripts differ significantly (P<0.01) from each other row wise.

Table 2: Average quantity, quality and composition of milk in Jersey crossbred cows in different DPD.

Months of lactation	1st Group	2nd Group
Milk quantity, (Kg /cow/day)		
1st	6.51^{a}±0.82	6.55^{a}±0.74
2nd	7.89^{a}±0.75	6.98^{b}±0.69
3rd	8.52^{a}±0.64	7.43^{b}±0.18
4th	7.54^{a}±0.53	6.41^{b}±0.25
Milk quality, MBRT (Minute)		
1st	182.86^{a}±15.42	178.10^{a}±20.11
2nd	260.07^{a}±18.41	166.07^{b}±28.45
3rd	218.57^{a}±22.32	170.36^{b}±23.11
4th	292.86^{a}±20.26	136.07^{b}±25.00
Milk fat (%)		
1st	4.27^{a}±0.12	4.42^{a}±0.15
2nd	4.19^{a}±0.11	4.28^{a}±0.12
3rd	4.07^{a}±0.14	4.10^{a}±0.11
4th	4.10^{a}±0.11	4.05^{a}±0.14
Milk SNF (%)		
1st	8.19^{a}±0.14	8.17^{a}±0.16
2nd	8.14^{a}±0.13	8.12^{a}±0.14
3rd	8.12^{a}±0.11	8.11^{a}±0.12
4th	8.24^{a}±0.12	8.32^{a}±0.15
Milk total solid (%)		
1st	12.46^{a}±0.12	12.59^{a}±0.10
2nd	12.33^{a}±0.10	12.40^{a}±0.08
3rd	12.19^{a}±0.09	12.21^{a}±0.11
4th	12.34^{a}±0.11	12.37^{a}±0.12

Means with different superscripts differ significantly (P<0.01) from each other row wise.

found higher milk pH of cows maintained on poor hygiene status which was one of the vulnerable factors for IMI in Jersey crossbred cows. Bhakat *et al*. (2017c) reported that higher milk pH of cow suffering from SCM. Analyzed data of milk electrical conductivity (mS/cm) (EC) revealed that almost similar value during first month of lactation in both group but second month onwards significantly (P<0.01) lower EC found in 1st than 2nd group. During all 4 months, the 1st group milk samples had normal milk EC but in 2nd group milk sample had higher EC. Kumari *et al*. (2018) reported that milk EC, SCC, MCMT and SFMT were suitable diagnostic tests for SCM diagnosis in dairy cows. All four tests of milk samples clearly indicated that cows of 2nd group developed SCM as lactation progressed with no clinical symptoms.

Milk production and milk composition

Statistically analyzed milk production data (Table 2) revealed that total milk production per day per cow were almost similar in both group in first month but second month on wards significantly (P<0.01) higher milk production was recorded in 1st than 2nd group. The reason of significantly (P<0.01) higher milk production in 1st group might be due to optimum DPD (50-60 days) which resulted in better recovery of udder health status and less NEB (post-calving) as compared to 2nd group. Moreover, prolonged DPD (>60 days) in 2nd group may lead to higher BCS at calving and it resulted in higher NEB (early lactation) which was evidenced from higher rate of negative changes in BCS in 2nd than 1st group. The optimum DPD might had helped to achieve optimum BCS at parturition in 1st than 2nd group which in turn was reflected in better milk yield in 1st group. Paul *et al.* (2018b) found that Jersey crossbred cow of this region can produce average milk 6 - 9 kg/day/cow. Singh *et al*. (2020b) reported about important role of far-off and close-up period of dry cow to improve udder health status. Analyzed data of milk composition of present study revealed non-significant difference in percent of fat, SNF, total solid in 1st and 2nd group milk samples during all four lactation months. Milk samples of both groups contained normal and standard percent of fat, SNF, total solid. Singh *et al* (2020c) found that the cows supplemented with *Alphatocopherol* produced higher quantity of milk with almost similar milk composition. Increased milk production in this study is in line with findings and suggestion of earlier studies of Bhakat *et al.* (2015).

Milk quality

Statistically analyzed MBRT (minute) data (Table 2) revealed that almost similar MBRT value was found during first month of lactation in both group but second month onwards significantly (P<0.01) higher MBRT found in 1st than 2nd group and similar trend continue up to 4th months. It is based on fact that colour imparted to milk by addition of a dye such as methylene blue disappears more or less quickly. The agencies responsible for oxygen consumption were bacteria

Table 3: Average BCS ± SE and changes in BCS of Jersey crossbred cows in different DPD at lower Gangetic region.

BCS evaluation period	DPD (Dry period duration)			
	1st Group		2nd Group	
	Mean BCS	Changes in BCS	Mean BCS	Changes in BCS
At time of drying off	2.41^{a}±0.03	-	2.45^{a}±0.04	-
At parturition	3.52^{a}±0.04	+ 1.11	4.01^{b}±0.05	+ 1.56
30 days after parturition	3.23^{a}±0.03	- 0.29	3.52^{b}±0.03	- 0.49
60 days after parturition	3.12^{a}±0.02	- 0.11	3.29^{b}±0.04	- 0.23
90 days after parturition	3.00^{a}±0.01	-0.12	3.02^{b}±0.02	- 0.27
120 days after parturition	2.98^{a}±0.02	- 0.02	2.91^{b}±0.01	- 0.11

Means with different superscripts differ significantly (P<0.05) from each other row wise.

present in milk samples. Thus, time of reduction was taken as a measure of the number of organisms in milk according to Wathore and Bhakat (2016). Kumari *et al*. (2019) found that supplementation of tri-sodium citrate was an effective, easy and cost-effective management practices to increase milk quality and quantity. Bhakat *et al*. (2017b) reported that IMI lead to changes in glandular tissue of the udder. So it is essential to monitor IMI in dairy cows in order to maintain milk quality and udder health.

Body condition score

Statistically analyzed BCS data (Table 3) revealed that initial BCS (at time of drying off) of both groups were similar. As dry period progressed with different duration, BCS at parturition was significantly ($P<0.05$) differed between two group. At the time of calving, BCS was significantly ($P<0.05$) higher in 2nd group as compared to 1st group. A similar trend was recorded up to 90 days but after 120 days significantly ($P<0.05$) lower BCS was recorded in 2nd group as compared to 1st group. During dry period, BCS followed more increasing trend in 2nd than 1st groups due to prolonged DPD (>60 days) in 2nd than 1st groups. This had led to over conditioning of 2nd group's cows at calving whereas 1st group's cows achieved optimum BCS at calving mainly due to comparative shorten DPD (50-60 days).

CONCLUSION

It can be concluded that dry period duration of 50-60 days can lead to achieve optimum BCS at calving and better over to prolonged DPD (>60 days) which has a negative impact on udder health and milk production. Suitable changes in BCS from dry period to calving is beneficial to get higher milk production, quality and better maintenance of body condition and udder health of Jersey crossbred cows at tropical lower Gangetic region.

REFERENCES

Bhakat, C., Singh, A., Kumari, T., Chatterjee, A., Mandal, D.K., Rai, S. and Dutta, T.K. (2019) Dairy development at lower Gangetic region: Constraints and its management. Advances in Economics and Business Management. 6(05): 344-347.

Bhakat, C., Chatterjee, A., Mandal, DK., Karunakaran, M., Mandal, A., Garai, S., Dutta, T.K. (2017b) Milking management practices and IMI in Jersey crossbred cows in changing scenario. Indian Journal of Animal Sciences. 87(4): 95-100.

Bhakat, C., Chatterjee, A., Mandal, A., Mandal, D.K., Karunakaran, M., Dutta, TK., (2017c). Effect of cleanliness and hygiene on occurrence of mastitis in crossbred cows in WB. Life Sciences International Research Journal. 4(1): 10-14.

Bhakat, C., Mandal, A., Mohammad, A., Rai, S., (2017a). Factors affecting hygienic milk production for farmers of Nadia Dist. Journal of Agricultural Engineering and Food Technology. 4(1): 13-16.

Bhakat, C., Mandal, DK., Chatterjee, A., Karunakaran, M., M, Asif., Rai, S., Mandal, A. (2016). Influence of clean milk production on incidence of sub-clinical mastitis in cows at lower Gangetic regions. Journal of Agricultural Engineering and Food Technology. 3(3): 248-252.

Bhakat, C., Mandal, D.K., Rai, S., Chatterjee, A., Mandal, A., KarunaKaran, M. and Garai, S. (2015). Commercial Production of Hygienic Milk at Eastern India. Workshop Cum Dairy Industry Partners' Meet on Commercialization of Dairying through Production and Traditional Processing, NDRI-ERS, Kalyani, 12/12/15: 81-84.

Kumari, T., Bhakat, Champak and Singh, A.K. (2020). Adoption of management practices by the farmers to control sub-clinical mastitis in dairy cattle. Journal of Entomology and Zoology Studies. 8(2): 924-927.

Kumari, T., Bhakat, C., Choudhary, R.K. (2018). A review on subclinical mastitis in dairy cattle. International Journal of Pure and Applied Bioscience. 6(2): 1291-1299.

Kumari, T., Bhakat, C., Singh, A.K., Sahu, J., Mandal, D.K., Choudhary, R.K., (2019). Low cost management practices to detect and control sub-clinical mastitis in dairy cattle. International Journal of Current Microbiology and Applied Sciences. 8(05): 1958-1964.

Paul, A., Bhakat, C., Mondal, S. and Mandal, A. (2020). An observational study investigating uniformity of manual body condition scoring in dairy cows. Indian Journal of Dairy Science. 73(01): 77-80.

Paul, A. and Bhakat, C. (2018a). Studies on the Associations Among Some Management Factors, Body Condition Score and Udder Health Status in Jersey Crossbred Cows. M.V.Sc Thesis Submitted to NDRI, Karnal and Haryana.

Paul, A., Bhakat, C., Mandal, D.K., Mandal, A., Mohammad, A., Chatterjee, A., Rai, S. (2018b). Influence of udder hygiene management on milk characteristics in Jersey cross-bred cows at lower Gangetic region. International Journal of Current Microbiology and Applied Sciences. 7(08): 1264-1272.

Paul, A., Bhakat, C., Mandal, D.K., Mandal, A., Mohammad, A., Chatterjee, A., Dutta, T.K. (2019). Relationship among body condition, subcutaneous fat and production performance of Jersey crossbred cows. Indian Journal of Animal Sciences. 89(5): 578- 580.

Pranay, B., Bhakat, C., Ghosh, M.K., Dutta, T.K., Das, R., (2015a). Relationship among intramammary infection and raw milk parameters in Jersey crossbred cows under hot-humid climate. Journal of Animal Research. 5(2): 317-320.

Pranay, B., Bhakat, C., Pankaj, P.K., Bhat, S.A., Prakash, M.A., Thul, M.R., Japheth, K.P., (2015b). Relationship of udder and teat conformation with intra-mammary infection in crossbred cows under hot-humid climate. Veterinary World. 8(7): 898-901.

Pranay, B., Bhakat, C., Puhle, JK., Tamboli, P., (2017). Interdepen--dence and distribution of subclinical mastitis and intra-mammary infection among udder quarters in Jersey crossbred cows. International Journal of Agriculture Sciences. 9(21): 4235- 4237.

Pranay, B. and Bhakat, C. (2019). Association among feeding after milking, animal factors and post milking standing period and effect of post-milking standing period on intra-mammary infection in crossbred cows. International Journal of Livestock Research. 9(5): 136-143. doi:10.5455/ ijlr.20181027064304.

Singh, A.K., Bhakat, Champak, Mandal, D.K., Mandal, A., Rai, S., Chatterjee, A. and Ghosh, M.K. (2020a). Effect of reducing energy intake during the dry period on milk production, udder health and body condition score of Jersey crossbred cows in the tropical lower Gangetic region. Tropical Animal Health and Production. Published online on 3 January 2020 Publication DOI- https://doi.org/10.1007/s11250-019-02191-8, Pp; 1- 11.

Singh, A.K., Bhakat, Champak, Yadav, D.K., Kumari, T., Mandal, D.K., Rajput, M.S. and Bhatt, N. (2020b). Effect of pre and post- partum Alphatocopherol supplementation on body measurements and its relationship with body condition, milk yield and udder health of Jersey crossbred cows at tropical lower Gangetic region. Journal of Entomology and Zoology Studies. 8(1): 1499-1502.

Singh, A.K., Bhakat C, Kumari, T., Mandal, D.K., Chatterjee, A. and Dutta, T.K. (2020c). Influence of alteration of dry period feeding management on body weight and body measure--ments of Jersey crossbred cows at lower Gangetic region. Journal of Animal Research. 10(1): 137-141.

Wathore, S.B and Bhakat, C., (2016). Effect of Some Management Practices on Udder Health Status and Milk Composition of Cows at Lower Gangetic Region, MVSc thesis Submitted to ERS, NDRI, Kalyani.