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Effect of Weaning and Natural Suckling on the Colostrum, Milk and Dry Matter Intake and Growth Performance of Sahiwal Calves

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ABSTRACT

Background: The young calves are the future replacement stock in any farm. Traditionally calves are allowed to suckle their dams while in modern intensive dairy farming calves get separated from the dam. The current study was aimed to find the influence of weaning and natural suckling on the colostrum, milk and dry matter intake growth performance of Sahiwal calves.

Methods: Twelve newborn Sahiwal calves were selected and divided into 2 groups, one group was weaned from their dams immediately after birth (weaned group) and another allowed to suckle their dam (suckled group). The parameters were taken daily for colostrum intake, weekly for milk intake and fortnightly for total dry matter intake (from milk, green fodder and concentrate), body weight and average body weight gain.

Result: The mean daily colostrum intake during the first 3 feedings were significantly (P<0.05) lower in weaned calves as compared to suckled calves. The mean daily milk intake was significantly (P<0.05) higher in suckled (3.37 kg/day) as compared to weaned (2.80 kg/day) calves whereas average total dry matter intake did not differ between weaned and suckled calves. The mean final body weights at 12th fortnight was only numerically higher in suckled group of calves as compared to weaned group of calves while the overall average daily gain (ADG) was significantly (P<0.01) higher in case of suckled calves (0.419±0.012 kg/day) than weaned (0.377±0.009) group of Sahiwal calves. It was concluded that the colostrum and milk intake performance as well as the final body weight and average daily body weight gain was improved in naturally suckled Sahiwal calves as compared to weaned calves.

Key words: Growth, Health, Immune status, Sahiwal Calves, Weaning and suckling.

INTRODUCTION

The successful calf rearing is the key to success of dairy farm enterprise because these young calves are the future replacement stock. In traditional system of management of cow calves in India, they are allowed to suckle their dams for their milk feeding as well as for the let-down of milk. In most of the intensive dairy farming it is necessary to remove the calf from the dam immediately or shortly after the parturition and rear the calf on whole milk or milk replacers substituted using milk pail (Bucket or nipple) but in cow which is a social animals with strong maternal instinct, their calves and dam relationships are closely bonded, and the cow calves become more stress when separated from the dam (Foulkes, 2005). Therefore they do not consume needed amount of colostrum (Smijisha 2007), depriving the immunoglobulin during early post-natal period resulting in higher morbidity and mortality.

The artificial rearing or weaning of calves has been found to be adversely affecting the growth and health of calves (Singh *et al.*, 2019) due to large number of factors particularly in tropics. In weaning system of rearing calves can show a distinctive distress response both when they are separated from the cow, and later when they are weaned from milk. Keeping the aforesaid in view present study was planned to investigate the effect of weaning and natural suckling on the colostrum intake, milk intake, total dry matter intake and growth performance of Sahiwal calves.

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MATERIAL AND METHODS

The present study was conducted at the Livestock Research Centre, ICAR-National Dairy Research Institute, Karnal (Haryana) in year 2017. National Dairy Research Institute is located at an altitude of 250 meters above mean sea level, latitude and longitude being 29042" N and 77054" E respectively. The calves were divided into two homogeneous groups on the basis of age and body weight and named as weaned Group (n=6) and suckled Group (n=6). The experimental period was of 180 days from birth of calves. Suckling group calves were allowed to suckle from the dam (own mother) twice a day before/after milking from birth to 90 days of age. Weaning group calves were weaned

immediately after birth (calves do not suckled from mother/ dam) and termed as non-suckling group. Each calf in Suckled group was fed with colostrum of its own dam within few hours after birth and twice daily for first 5 days of age and later that was allowed to suckle its dam twice daily before/after milking. The non-suckling calves were fed as per standard protocol followed at NDRI as presented in Table 1, 2 and 3.

Parameters recorded

Body weight (kg)

The birth weight of calves was recorded at the time birth and after that the body weight of calves was recorded regularly at fortnightly intervals by the use of electronic weighting machine.

Colostrum intake (kg)

To calculate the colostrum intake in naturally suckled group of calves, calves were weighed before and after colostrum feeding and in case of the weaned group of calves weighed amount of colostrum was offered and the residual was measured to calculate the colostrum intake in weaned group.

Milk intake (kg/day)

Milk intake of natural suckled calves

Milk intake of the calves in the suckling group recorded once in a week. The complete milking was done on the seventh day without allowing the calves to suckle. However, the calves were allowed to suckle their dams at the start of milking just for the let-down of milk. The milk intake by the calves were calculated by deducting the average daily milk yield of the cow on other 6 days of the week from the milk yield on the 7thday when the calves were not allowed to suckle their dams.

Milk intake of suckling calf =
[Total milk yield of 7th day-Average milk yield of 6 days]

Milk intake of weaned calves

The weaned calves were offered a weighted amount of milk as per their feeding schedule and the residual was measured to calculate the actual milk intake in Table 2.

Dry matter intake (kg/day)

Total dry matter intake (DMI) for weaned and suckled group was calculated at fortnightly intervals by taking into account the daily average amount of roughage and concentrate mixture consumed in Table 1.

Statistical analysis

All the data obtained were categorized according to the objectives of the study and were analysed with the help of statistical software SPSS (version. 17). The significance of effects of treatments on the different dependent variables was analysed using analysis of variance (ANOVA) procedure and the differences between the means were compared using Tuckey post-hoc test.

Ethical approval

For the present study, the plan of experiment was approved by Institutional Animal Ethics Committee for animal experiments and the ethical guidelines of the National Dairy Research Institute, Karnal (Haryana) were followed during all the animal experimentations

RESULTS AND DISCUSSION

Daily colostrum Intake

In the present study, the overall means of daily intake of colostrum up to 5 days after birth in weaned and suckled groups of Sahiwal calves were 2.42±0.10 and 2.65±0.08 kg/day respectively which are presented in Table 4. There was no significant difference between weaned and suckled groups in the overall daily intake of colostrum, however, the mean intake of colostrum from 1st to 3rd day of birth was significantly ($P<0.05$) higher in suckled than the weaned groups of calves. On the subsequent days (4th and 5thday), mean daily colostrum intake in both the group was almost similar. Daily intake of colostrum during first 3 days was lesser in weaned calves because calves did not have any experience of drinking colostrum from pail. However, after the 3 days of colostrum feeding, weaned calves might get learned to drink colostrum from pail which could explain the non-significant difference in the amount of colostrum intake in both groups of calves from fourth to fifth day after birth. The almost similar finding has been reported by Kumar and Kamboj (2014) who described that the average colostrum intake for first 2 days was significantly higher in suckled buffalo calves as compared to weaned calves whereas overall mean milk intake was 2.79±0.08 and 2.61±0.01 kg in suckled and weaned group of buffalo calves respectively, which did not differ significantly. Stafford *et al*. (2005) had also reported that majority of the calves become efficient drinkers within 48 hours of birth while small number of slow feeders may need individual feeding at least up to 4 days after birth.

Table 1: Feeding schedule of calves.

Age of calf (months)	Whole milk	Concentrate mixture (kg)	Green fodder
6-30 days	1/10th of body weight	Introduced after 15 days	-
1-2 months	1/10th of body weight	0.250	*ad libitum*
2-3 months	1/20th of body weight	0.500	do
3-4 months	1/20th of body weight	0.750	do
4-6 months	-	0.700-1.00	do
5-6 months	-	0.700-1.00	do

Milk intake (kg/day) by calves

The mean ± SE of milk intake by the experimental Sahiwal calves are depicted in Table 5. The overall mean for intake of milk by calves up to 16th week of age was 2.80±0.06 and 3.37±0.06 kg/day in weaned and suckled group of Sahiwal calves respectively. The mean daily milk intake was significantly (P<0.01) higher in suckled calves as compared to weaned group of calves. This difference in daily milk intake might be due to better digestion of milk due to more mixing of salivary enzymes with milk and also due to realization of natural drinking behaviour under suckling system. The results obtained in the present study are in agreement with the finding of Singh *et al.* (2019) who revealed that the mean squares value of milk intake from sixth day after birth to 12 weeks of age in suckled calves were significantly higher (P<0.01) as compared to weaned buffalo calves. Mendoza *et al*. (2010) who reported that Holstein calves managed under restricted suckling system (7.2 kg/day) had a higher (p<0.001) average milk intake than calves under artificial rearing (5.4 kg/day). Similarly, Boonbrahm *et al*. (2004c) indicated that 16.3% more milk was consumed by restricted suckled calves as compared to bucket reared calves. A significant higher average milk intake in suckled buffalo calves (4.26 kg/day) in comparison to weaned calves (3.05 kg/day) has been shown by Singh and Kamboj (2015). However, no significant difference between the milk intake of the calves under restricted suckling and artificial rearing has been reported in Holstein x Zebu calves by Hernandez *et al*. (2006) and in buffalo calves by Kumar and Kamboj (2014).

Table 2: Dry matter content (%) of feeds and fodders.

Feeds and fodders	Dry matter (%)
Concentrate mixture	90.27 (88.8 - 92)
Green fodder (Maize, berseem, oat)	16.63 (14.4 - 19.8)

Table 3: Chemical composition of milk offered to the calves.

Component	Weaned calves	Suckled calves
Fat (%)	4.55	5.43
Solids-Not-Fat (SNF) (%)	8.73	8.81
Total solid (%)	13.28	14.24

Table 4: Mean ± SE of average daily colostrum intake (kg/day) by calves.

Day after birth	Weaned	Suckled
1	1.65^{A}±0.11	2.00^{B}±0.09
2	2.11^{A}±0.07	2.45^{B}±0.07
3	2.48^{A}±0.06	2.71^{B}±0.04
4	2.81±0.10	2.93±0.06
5	3.03±0.13	3.18±0.09
Overall mean	2.42±0.10	2.65±0.08

Means bearing different superscripts differ significantly (P<0.05).

Table 5: Mean ± SE of average daily milk intake (kg/day) by calves.

Weeks after birth	Weaned Calves	Suckled Calves
1	2.92±0.06	3.41±0.06
2	3.23±0.09	3.65±0.09
3	3.46±0.05	3.95±0.07
4	3.66±0.06	4.10±0.09
5	3.46±0.04	4.21±0.07
6	3.40±0.04	4.13±0.08
7	3.22±0.13	3.91±0.15
8	3.10±0.10	3.70±0.07
9	2.84±0.06	3.48±0.07
10	2.60±0.10	3.35±0.08
11	2.42±0.12	3.13±0.08
12	2.28±0.07	2.88±0.09
13	2.08±0.03	2.68±0.14
14	2.06±0.04	2.43±0.15
15	2.06±0.08	2.50±0.17
16	1.98±0.06	2.48±0.14
Overall mean	2.80^{A}±0.06	3.37^{B}±0.06

Means bearing different superscripts differ significantly (P<0.01).

Total dry matter intake (from milk, green fodder and concentrate) (kg/day) by Sahiwal calves

The average of total dry matter intake (from milk, green fodder and concentrate) by experimental Sahiwal calves is presented in Table 6. The overall means of total dry matter intake was 1.30±0.17 and 1.42±0.18 kg/calf/day in weaned and suckled groups of calves respectively. There was no significant difference in value of total dry matter intake of weaned and suckled group of calves. In agreement with the present findings, Froberg *et al*. (2008) also reported similar total intake of metabolisable energy from milk and concentrate in the restricted suckled (1051 MJ) and artificially reared calves (1092 MJ). Findings of present study was further corroborated by the findings of Kumar and Kamboj (2014) and Singh and Kamboj (2015) who also did not find any significant difference between average total dry matter intake of weaned and suckled group of buffalo calves. Contrary to this, Bharti *et al*. (2015) reported that the overall average daily dry matter intake in buffalo calves suckled up to 90 days after birth was significantly (P<0.01) higher (0.873 ± 0.01 kg) than weaned at birth (0.759±0.01kg) and calves suckled up to 45 days after birth (0.791±0.00 kg) and stated that the higher DMI in suckling than weaned calves might be due to more dependency on milk in suckled calves being milk the principal feed whereas, Azim *et al*. (2011) reported significantly higher DMI in late weaned calves than early weaned buffalo calves.

Body weight (Kg) of calves

The mean ± SE of body weights of Sahiwal calves in weaned and suckled groups at birth and then at fortnightly intervals up to 12 fortnights are presented in Table 7. The average birth weights of weaned and suckled groups of calves were (20.6±0.6 and 21.3±1.2 kg) which did not differ significantly

between both the groups. The mean final body weights at 12th fortnight were 88.7±4.4 and 96.9±3.3 kg in weaned and suckled groups respectively which was numerically higher in suckled group of calves as compared to weaned group of calves. Findings of present study are on similar lines with the findings of Mendoza *et al*. (2010) who reported that the restricted suckled calves had a higher body weight at weaning (84.3 vs. 73.3 kg) than artificial reared calves. Sanh *et al*. (1997) reported that the body weight at 6 months of age was higher for restricted suckled calves (109 kg) than for artificial reared calves (105 kg). Roth *et al*. (2009) found that in dual purpose dairy cattle the sucked calves gained significantly more weight during the milk feeding period than the bucket fed calves (138.9±5.6 vs. 117.0 ± 2.6 kg). Further, Bharti *et al*. (2015) reported that the final body weight at 3 month of age in buffalo calves suckled up to 90 days after birth was significantly (P<0.01) higher (79.71 kg) than weaned at birth (69.51 kg) and calves suckled up to 45 days after birth (73.59 kg).

Average daily gain (kg) (ADG)

The average daily gain in body weight recorded at fortnightly intervals in weaned and suckled groups are presented in Table 8. The overall average daily gain (ADG) was significantly (P<0.01) higher in case of suckled calves than weaned group of Sahiwal calves. The overall mean ± SE of ADG of Sahiwal calves were 0.377±0.009 and 0.419±0.012 kg/day in weaned and suckled group of calves respectively. High weight gain in suckled calves is mainly ascribed to higher fat content in the residual milk, but it can also be related to differences in milk intake (Sanh *et al*., 1997; Mejia *et al*., 1998) and the associated improved health conditions of the calves (Yilma *et al*., 2006). Further, calves allowed to suckle had a higher level of oxytocin compared to bucket-fed calves (Lupoli *et al*., 2001). Froberg *et al*. (2008) also observed that the milk suckled by restricted suckling calves contained more fat and metabolisable energy (ME) per kg than the parlour milk fed to artificially reared calves (6.1% vs. 4.2% and 3.5 MJ/kg vs. 2.9 MJ/kg). Boonbrahm *et al*. (2004c) found that the energy intake from milk and the total ration respectively in the bucket reared (BR) group was 50% and 38% lower in AR group of calves than in the restricted suckling (RS) group of calves. In addition, suckled group of calves spent more time for milk feeding which may have resulted in the more secretion of saliva, better mixing of the milk with digestive enzymes resulting in to better utilization of colostrum as well as milk resulting in improved daily weight gain. The present finding are in agreement with those reported by Singh *et al.* (2019) who found body weight gain was significantly (P<0.01) higher in suckled buffalo calves as compared to weaned calves. Mendoza *et al*. (2010) reported that the restricted suckled calves gained more body weight (0.813 vs. 0.656 kg/day) as compared artificial reared calves. Sanh *et al*. (1997) reported that average daily weight gain from birth to 6 months for restricted suckled calves (445 g/day) was higher than for artificial reared calves (422

Table 6: Mean ± SE of daily total dry matter intake (Kg/day/calf) by calves at fortnightly interval.

Fortnight after birth	Weaned	Suckled
1	0.43	0.52
2	0.59	0.68
3	0.74	0.83
4	0.92	1.02
5	1.06	1.15
6	1.18	1.34
7	1.36	1.51
8	1.55	1.69
9	1.68	1.80
10	1.87	2.04
11	2.10	2.23
12	2.21	2.35
Overall mean	1.30±0.17	1.42±0.18

Table 7: Mean ± SE of average body weight (Kg) of calves at fortnightly interval.

Fortnight after birth	Weaned	Suckled
Weight at birth	20.6±0.6	21.3±1.2
1	24.8±0.7	26.0±1.6
2	29.5±1.2	31.3±1.6
3	34.5±1.7	36.9±1.4
4	39.9±2.2	43.1±1.5
5	45.5±2.6	49.4±1.6
6	51.4±3.1	56.0±1.9
7	57.2±3.3	62.3±2.7
8	63.3±3.5	69.0±3.0
9	69.7±3.8	75.8±3.2
10	76.2±3.9	82.8±3.5
11	82.4±4.2	89.8±3.3
12	88.7±4.4	96.9±3.3

Table 8: Mean ± SE of average daily body weight gain (kg/day) of Sahiwal calves.

Fortnight after birth	Weaned	Suckled
1	0.278±0.020	0.311±0.031
2	0.320±0.034	0.350±0.041
3	0.333±0.034	0.377±0.025
4	0.360±0.038	0.411±0.032
5	0.373±0.028	0.422±0.032
6	0.393±0.038	0.438±0.043
7	0.386±0.016	0.422±0.053
8	0.406±0.019	0.444±0.042
9	0.426±0.024	0.450±0.057
10	0.433±0.010	0.472±0.038
11	0.413±0.030	0.466±0.027
12	0.420±0.029	0.472±0.041
Overall mean	0.377^{A}±0.009	0.419^{B}±0.012

Means bearing different superscripts differ significantly (P<0.01).

g/ day). Higher average daily body weight gain in suckled calves as compared to artificially reared calves has been also observed in several previous studies in calves (Boonbrahm *et al*., 2004a; Gonzalez *et al*., 1984) and in buffalo calves (Kumar and Kamboj, 2014; Bharti *et al*., 2015, Singh *et al*., 2019). In contrast to the present findings, Sikka *et al.* (2002) and Schoonmaker *et al*. (2004) did not find any significant effect on total body weight gain in suckling versus non-suckling buffalo calves (from birth to 3 months).

CONCLUSION

From the findings of this study it could be concluded that the colostrum and milk intake performance as well as the final body weight and daily body weight gain was better in naturally suckled Sahiwal calves as compared to weaned calves and therefore, calf management practices should include natural suckling system particular in indigenous breeds.

REFERENCE

Azim, A. Khan, A.G., Anjum, M.I. and Nadeem, M.A. (2011). Effect of milk replacer and early weaning diets on growth performance of buffalo calves during weaning period. Pak. Vet. J. 31(1): 23-26.

Bharti, P.K., Dutt, T., Patel, M. and Pandey, H.O. (2015). Success rate, growth performance and feed efficiency of buffalo calves reared at different feeding programs under semi-intensive systems of rearing. Indian J. Anim. Sci. 85(3): 320-323.

Boonbrahm, N., Peters, K.J. and Intisang, W. (2004a).The influence of calf rearing methods and milking methods on performance traits of crossbred dairy cattle in Thailand. 1. Milk yield and udder health. Arch. Tierz., Dummerstorf. 47(3): 211-224.

Boonbrahm, N., Peters, K.J. and Kijora, C. (2004c). The influence of calf rearing methods and milking methods on performance traits of crossbred dairy cattle in Thailand. 3. Calf performance, *Arch. Tierz.,* Dummerstorf. 47 (5): 405-414.

Foulkes, D. (2005). Management of orphaned or weaned buffalo calves. *www.nt.gov.au/dpifm.*

Froberg, S., Gratte, E., Sjaunja, K.S., Olsson, I., Berg, C., Orihuela, A., Galina, C.S., Garcia, L. andLidfors, L. (2008). Effect of suckling ('restricted suckling') on dairy cows' udder health and milk let-down and their calves' weight gain, feed intake and behaviour. Appl. Anim. Behav. Sci. 113: 1-14.

Gonzalez, Y.M., Goic, M.L. and Castro, L.L. (1984). Restricted suckling in spring-born calves and its effect on milk production. AgriculturaTecnica. 44: 179-183.

Hernandez, C., Orihuela, A., Froberg, S. and Lidfors, L.M. (2006). Effect of restricted suckling on physiological andbehavioural stress parameters in dual-purpose cattle in the tropics. Livest. Sci. 99: 21- 27.

Kumar, A. and Kamboj, M.L. (2014) Influence of weaning on the performance and behaviour of calves and their dams in Murrah buffaloes. PhD Thesis Submitted to ICAR-NDRI, Deemed University Karnal.

Lupoli, B., Johansson, B., Uvn¨as-Moberg, K. and Svennersten-Sjaunja, K. (2001). Effect of suckling on the release of oxytocin, prolactin, cortisol, gastrin, cholecystokinin, somatostatinand insulin in dairy cows and their calves. J. Dairy Res. 68: 175-187.

Mejia, C.E., Preston, T.R. and Fajersson, P. (1998). Effects of restricted suckling versus artificial rearing on milk production, calf performance and reproductive efficiency of dual purpose Mpwapwa cattle in a semi-arid climate. Livest. Res. Develop. 10(1).

Mendoza, A., Cavestanybc, D., Roigc, G., Ariztiac, J., Pereirac, C., Mannac, A.L., Contrerasd, D.A. and Galinad, C.S. (2010). Effect of restricted suckling on milk yield, composition and flow, udder healthand postpartum anoestrus in grazing Holstein cows. Livest. Sci. 127(1): 60-66.

Roth, B. A., Barth, K., Gyagax, L. and Hillmann, E. (2009). Influence of artificial vs. mother- bonded rearing on sucking behaviour, health and weight gain in calves. Appl. Anim. Behav. Sci. 119: 143-150.

Sanh, M.V., Preston, T.R. and Le Viet, L. (1997). Effects of restricted suckling versus artificial rearing on performance and fertility of crossbreed F1 (Holstein Friesian × Local) cows and calves in Vietnam. Livest. Res. Rural Develop. 9: 4.

Schoonmaker, J.P., Cecava, M.J, Fluharty, F.L., Zerby, H.N. and Loerch, S.C. (2004). Effect of source and amount of energy and rate of growth in the growing phase on performance and carcass characteristics of earlyand normal-weaned steers. J. Anim. Sci. 82: 273-82.

Sikka, P., Sethi, R.K. and Tomer, A.K.S. (2002). Biochemical studies of suckling vs. non-suckling buffalo calves in relation to performance of dams. Indian J. Anim Sci. 72: 492-95.

Singh, P.K., Kamboj, M.L., Chandra, S., Kumar, A. and Kumar, N. (2019). Influence of weaning on growth, health and behaviour of Buffalo (*Bubalus bubalis*) calves. Indian J. Anim Res. 53(5): 680-684.

Singh, P.K. and Kamboj, M.L. (2015). Effect of various milk letdown stimuli on the performance and behaviour of Murrah buffaloes and their calves. PhD Thesis, ICAR-NDRI, Deemed University Karnal.

Smijisha, A.S. and Kamboj, M.L. (2007).Effect of methods of feeding and individual housing on growth and health status of buffalo calves. M. V. Sc. Thesis, NDRI Deemed University, Karnal, India.

Stafford, K.J., Mellor, D.J. and Corner, R. (2005). Suckling behaviour of hand reared new born dairy calves. New Zeal. Vet. J. 53(4): 246-48.

Yilma, Z., Gojjam, Y. and Shumye, M. (2006). Milk production level and calf-rearing system affecting Boran, Ethiopian zebu cattle breed, cow-calf performance. Livest. Res. Rural Develop. 18(5).