



Does age at weaning influences behaviour of Murrah buffalo calves under semi-intensive management conditions?

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ABSTRACT

The purpose of the study was to compare the behaviour of neonatal Murrah buffalo calves reared under weaning and suckling methods. Initially, 42 newly born calves were selected and they were equally but alternately assigned into 3 groups as suckling (Gr 1), weaning at birth (Gr 2) and weaning on 45th day (Gr 3). The different behavioural parameters of calves were recorded for first 15 days of suckling/weaning during each milk-feeding hour. The average daily milk intake of calves was significantly lower in Gr 1 than Gr 3 but higher than Gr 2. The time taken by calves for milk consumption was significantly higher in Gr 3 than Gr 1 or Gr 2. The learning time for self-feeding in Gr 2 was significantly higher than Gr 3 and Gr 1. The incidence of inter-suckling was significantly higher in Gr 3 than Gr 1 (11.49%) and Gr 2 (59.08%). The incidence of defecation and urination was non significantly higher in suckling than weaning groups. The total suckling score was significantly higher in Gr 3 than Gr 1 and Gr 2. Weaning in buffalo calves at birth yielded more success rate than weaning at 45th day. This study highlights deeper understanding of weaned calf behaviour which can be useful for adopting weaning management practice in buffaloes to promote clean milk production and to get other established benefits of weaning similar to dairy cattle.

Key words: Behaviour, Calves, Murrah buffalo, Suckling, Weaning

Dairy calves in artificial rearing system are meant to be weaned at earliest possible age for economic reasons (Garnsworthy 2005). When a young mammal is separated from its mother at weaning, a number of behavioural responses are typically observed. Furthermore, the learning abilities seem to be improved for a short period after weaning. As a matter of fact, calves which have been weaned for less than 2 weeks are faster in learning compared to those weaned at advanced stage of life (Veissier *et al.* 1989). One of the reasons for not weaning buffalo calves at birth or later stage is might be due to fear of let-down problem caused by strong maternal instinct. However, recently few workers (Yadav *et al.* 1999, Sikka *et al.* 2002, Kantharaja 2011) have also tried to wean the calves at different ages. But these studies did not conclude about the impact of weaning on behaviour of buffalo calves. Earlier studies showed that critical period for buffalo calf survival is mainly during first month of age. Therefore, alternatively buffalo calf weaning can be done at the age of 45 day onwards also. Considering that weaning during this period will lead the calf to consume considerable amount of feeds and fodder. Thus, the survivability of weaned calf after 45

days may be increased even on low intake of whole milk in poor learner. Keeping in view these facts, the present study has been undertaken to wean the Murrah buffalo calves either at birth (0 day weaning) and at 45 day of age (early weaning) to see the effect of weaning methods on their behaviour in different groups.

MATERIALS AND METHODS

Location and climatic conditions: Murrah buffalo calves from Cattle and Buffalo Farm of the Institute (IVRI), were used. The climatic condition of the place touches both the extremes, viz. cold (approximately 5°C in winter) and hot (approximately 45°C in summer). The relative humidity ranges between 15 and 85%. The average annual rainfall is about 90 to 120 cm and most of which is received from July to September.

Grouping of experimental animals: All the available advanced pregnant buffaloes were watched for calving. The normal born calves were equally but randomly allocated into 3 groups; suckling (Gr 1), weaning at birth (Gr 2) and weaning on 45th day (Gr 3). The parity order of dams was also considered while grouping the animals (Table 1). Initially 14 buffalo calves were selected in each group, but due to few cases of weaning failures during the experimental period, the final number of calves studied in group 2 and group 3 were 11 and 10 respectively.

Group 1/Gr 1 (Suckling or control): All calves were

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Table 1. Details of experimental animals

Groups	No. of calves selected	No. of calves studied	Parity order of dam
Gr 1	14	14	3.78 ^b
Gr 2	14	11	2.72 ^a
Gr 3	14	10	4.60 ^b

Means bearing different superscripts (a, b) within the row differ significantly ($P < 0.05$).

body weight of calves was recorded at every fortnight interval on digital balance. The suckling behaviour for Gr 1 and milk feeding behaviour of buffalo calves for Gr 2 and Gr 3 were recorded twice daily during the suckling/milk feeding hours from birth to first 15 days of age after birth (Gr 1) and weaning

(Gr 2 and Gr 3) by direct observation method. The behavioural observations were started when calf was allowed suckling in Gr 1 and the time when milk was offered to the calf in Gr 2 and Gr 3. Whether the calf showing

Table 2. Feeding schedule of weaned calves

Age of calf	Colostrum	Whole milk	Calf starter	Green fodder
00–03 days	1/10 th of body weight	Nil	Nil	Nil
04–56 days	Nil	1/10 th of body weight	<i>Ad lib.</i> from 16 th day onwards	
57–64 days	Nil	1/20 th of body weight	<i>Ad lib.</i>	<i>Ad lib.</i>
65–90 days	Nil	1/40 th of body weight	<i>Ad lib.</i>	<i>Ad lib.</i>

allowed to suckle from their respective dams during each milking from birth to 90 days of age. Each calf was fed on colostrums twice daily for first 3 days of age from its own dam within 30–60 min (min) after birth. Calves were given ample suckling time (5–10 min) as per their body weight during each milking hour. All calves were provided with good quality calf starter (CS) during day and night hours along with green fodder (berseem/oat/chopped maize) roughages from 16th day on *ad lib.* basis.

Group 2/Gr 2 (weaning at birth or zero day weaning): Calves were weaned immediately after birth. Each calf was fed on colostrum of its own dam within 30–60 min after birth and colostrums was given twice daily for first three days of age @ 10% of live body weight. From 4th day onwards, calves were reared artificially by pail feeding on whole milk till 90 days of age. Amount of whole milk given to the calves were adjusted as per their fortnightly body weight with advanced age. The feeding schedule of weaned calves is presented in Table 2.

Group 3/Gr 3 (Early weaning): Calves were allowed to suckle from their respective dams for initial 44 days (similar to group 1) and thereafter they were weaned at 45th day of age. Calves were artificially fed by pail feeding on whole milk and rest of the feeding protocol was similar to that of Gr 2.

Housing and health management of calves: The calves were housed individually in well ventilated, clean and dry *pakka* pens for 18 h daily (from 3:00 pm to 9:00 am) throughout the experimental period. They were let loose for 6 h daily during day hours (from 9 am to 3 pm) in a *kachha* and open paddock for exercise and to facilitate washing, cleaning and drying of calf shed. They had free access to fresh, clean wholesome water along with calf starter and green fodder in open paddock. During winter, proper bedding materials were provided to all calves to protect them from the cold.

Recording parameters and behaviour of calves: The

interest in suckling after offering teat to suckle or milk drinking/feeding after offering milk was considered for further observations. In accepted condition, parameters pertaining to suckling or milk feeding behaviour were recorded as follows:

Milk consumption: Although, milk intake in calves of all groups were individually recorded from birth to 90 days of age, but from suckling or drinking behaviour points of view, the milk consumption (kg) of calf was recorded twice daily, viz. morning and evening hours for first 15 days from birth (Gr 1) and weaning (Gr 2 and Gr 3). The quantity of milk consumed by calf in Gr 1 was calculated by taking the difference between post-suckling and pre-suckling body weight on electronic balance. The consumption in weaned groups (Gr 2 and Gr 3) was calculated as difference of quantity of milk offered and refused by individual calf.

Milk suckling or drinking time: The milk suckling or drinking time (min) of calf was recorded as soon as calf started suckling or milk feeding.

Milk suckling or drinking rate: The milk suckling or drinking rate (kg/min) was calculated as dividing the amount of milk consumed by calf (kg) by total time (min) taken by the calf to consume milk in particular shift. Additionally, assistance required or not during milk feeding, learning time, suckling or drinking instinct score, number of bouts, bellowing, licking to dam or inter-suckling, tail wagging, defecation and urination were also recorded.

Assisted suckling or drinking: The total number of shifts (morning or evening) a calf required assistance while suckling or milk drinking, were recorded.

Learning time: The total numbers of days of assistance required by a calf while suckling or milk drinking.

Suckling or drinking instinct score: This indicates that how much time a calf takes to start milk consumption after offering milk. Numerical scores given to each individual calf was indicated as 1- calf which started feeding within 1 min (good instinct), 2- calf which took 1 to 3 min to start

milk feeding (moderate instinct), and 3- calf which took more than 3 min up to maximum observed time i.e. 30 min (poor instinct).

Number of bouts: This indicated the total number of milk feeding bouts while suckling or drinking which only included duration at least continuously for 1 min.

Bellowing: The bellowing frequency of calf was recorded from 10 min before offering milk till complete suckling or drinking time.

Tail wagging: This indicated the total tail wagging time in second (sec) by each calf during suckling or drinking time and the proportion of calves showing this activity within the group.

Inter-suckling: This indicated the proportion of calves showing this activity within the group just after drinking milk. Inter-suckling is an activity between calves where they generally get enraged in sucking of body parts particularly mouth parts between each other. However, in case of suckling group it was correlated with liking of dam by its calf after suckling.

Defecation: The defecation time (sec) by each calf and the percentage of calves showing this activity within group was recorded from 10 min before offering milk till complete suckling or drinking time.

Urination: The urination time (sec) by each calf and the percentage of calves showing this activity within group was recorded from 10 min before offering milk till complete suckling/ drinking time.

-Total suckling or drinking score: Total suckling scores were derived based on suckling/drinking instinct score and whether assisted feeding required or not. The numerical suckling scores given to the calves were; 1: normal suckling (self-feeding with good instinct), 2: suckling with assistance (good/ moderate instinct), 3: suckling with difficulty (poor instinct) and 4: complete reluctant to suckle (no milk feeding at all).

Statistical analysis: The standard statistical analytical procedures (Snedecor and Cochran 1994) were adopted for analysis of the generated data under study using Statistical Analysis System (SAS) 9.2 version software.

RESULTS AND DISCUSSION

Acceptance of weaning practice: Out of 14 dam-calf pairs selected in each group, 78.6 % and 71.4 % of dam-calf pairs were successfully weaned in Gr 2 and Gr 3, respectively. The weaning practice could not be successful in the rest of calf-dam pairs, reasons being that dams had not permitted the milker for milking and problems in let-down of milk continued for more than three or four milking. The dams expressed restlessness, kicking, stepping, continuous bellowing and showed overall very bad temperament during milking hours. On the other hand, few calves were also very reluctant or showing difficulty while consuming milk with poor instinct; hence they were withdrawn from the experiment. The study revealed that the practice of weaning in buffalo may not be 100% successful either at birth or at early age (45th day) of calves.

The present findings are in agreement with Kantharaja (2011) with respect to weaning at birth only. The overall growth rate of calves in Gr 1 was significantly higher than Gr 2 but not significantly different from Gr 3. The result for growth performance in present finding is equally supported by other workers (Kantharaja 2011, Sikka *et al.* 2002).

Behaviour of calves

Milk consumption: The average milk consumption in each shift (morning and evening) by calves in different groups is presented in Table 3. The overall average milk consumption in both shifts was significantly ($P < 0.05$) higher in Gr 3 than Gr 1 and Gr 2. The higher intake of milk in Gr 3 might be due to older age (weaned at 45 days) and more milk requirement as per the prescribed feeding schedule of calves (Table 2). The present findings are in agreement with Kantharaja (2011) who also reported similar results; however he had compared only with weaning at birth and suckling group of calves.

Milk suckling or drinking time: The overall average milk suckling/drinking time was significantly ($P < 0.05$) higher in Gr 3 than Gr 1 and Gr 2, however there were no significant difference between Gr 1 and Gr 2 (Table 3). The higher time taken to consume milk in Gr 3 could be due to temperamental problems as these calves had slightly poor suckling instinct which led to high number of feeding bouts. Similar trend was observed for morning and evening shift where Gr 3 had significantly higher average time for milk consumption per shift than Gr 1 and Gr 2. Babu *et al.* (2004) concluded that the milk sucking time decreased with the advancement of age showing highest time during morning and lowest in the evening in calves housed in groups at 8 weeks of age. Mateous *et al.* (2006) reported that the age of calf had significant effects on some behaviour traits. Church (1997) concluded that the interval-weaned calves

Table 3. Average milk intake (kg), suckling/drinking time (min) and suckling/drinking rate (kg/min) in calves from 0–15 days (Gr 1 and II) or 45–60 days (Gr 3)

	Average milk intake (kg)		
	Gr 1	Gr 2	Gr 3
Day			
M	1.52±0.03 ^b	1.32±0.05 ^a	1.80±0.09 ^c
E	1.51±0.03 ^B	1.26±0.05 ^A	1.88±0.09 ^C
Overall	1.52±0.02 ^b	1.29±0.05 ^a	1.84±0.09 ^c
Average suckling or drinking time (min)			
M	7.80±0.33 ^a	7.93±0.33 ^a	9.49±0.80 ^b
E	7.60±0.24 ^A	7.79±0.35 ^A	9.59±0.81 ^B
Overall	7.70±0.28 ^a	7.86±0.34 ^a	9.54±0.80 ^b
Average suckling or drinking rate (kg/min)			
M	0.201±0.007	0.174±0.011	0.210±0.024
E	0.205±0.006 ^{ab}	0.170±0.010 ^a	0.216±0.024 ^b
Overall	0.203±0.006	0.172±0.011	0.213±0.023

Means bearing different superscripts (a, b) within the row differ significantly ($P < 0.05$). Means bearing different superscripts (A, B) within the row differ significantly ($P < 0.01$).

spent less time standing and pacing and more time eating compared to abrupt-weaned calves.

Milk suckling or drinking rate: The average milk suckling/drinking rate (kg/min) in each shift of calves is presented in Table 3. In evening shift, consumption rate was significantly ($P<0.05$) higher in Gr 3 than Gr 2 but nonsignificant from Gr 1, which might be due to higher milk consumption in evening than morning shift in this Gr 3. Similar trend was observed for average milk suckling/drinking rate in morning shift among the groups. The non significance of suckling/drinking rate in different groups attributed different age of weaning and temperament of calves at that respective period.

Behavioral parameters of calves while suckling/ milk drinking: The behaviour parameters while suckling or milk drinking in calves, viz. assisted feeding, suckling instinct score, bellowing, tail wagging, inter-suckling, defecation, urination and total suckling score are present in Table 4.

Assisted suckling or drinking: The average number of shifts (morning or evening) required assistance to calf for suckling or milk drinking in Gr 1 was significantly ($P<0.05$) lower than Gr 3 and Gr 2. This indicates that calves weaned at birth required highest number of shifts for assistance while milk drinking compared to calves weaned at 45th day of age, however calves in suckling group needed lowest assistance among the groups. The reason for higher assistance in Gr II could be that calves being younger in

age were expecting teat like structure during learning period (Lay *et al.* 1998). Although calf learned to drink but expectation of finger's presence while drinking continued for longer period (Loberg *et al.* 2008).

Learning time (days): The average numbers of days requiring to learn calf through self suckling or drinking milk in Gr 1 was significantly ($P<0.05$) lower than Gr 3 and Gr 2 (Table 4) indicating that calves in 0-day weaned group required highest number of days to learn self drinking, 45-day weaned calves learned slightly earlier than Gr 2, however calves in Gr 1 learnt earliest among the groups. The percentage of calves which needed continuous assistance even after 15 days of observation in Gr 2 and Gr 3 were 36.37 and 30 % respectively. However in Gr 1, 100 % calves learnt to self-suckling within this time period of observation.

Number of bouts: The overall average number of bouts for milk consumption was higher in Gr 3 followed by Gr 2 and Gr1; however this parameter was not significantly different from each other. The higher number of bouts/drinking attempts in Gr 3 indicated that some of the calves in group were taking less interest and consumed milk in many attempts after offering to them, which might be due difference in age and temperamental changes after 45 days weaning. Mateous *et al.* (2006) reported that the age of calf had significant effects on similar behaviour traits.

Inter-suckling: The overall average percentage of inter-

Table 4. Behavioural parameters of calves during suckling or milk drinking from 0–15 days (Gr 1 & II) or 45–60 days (Gr 3)

Parameters		Gr 1	Gr 2	Gr 3
Learning time (days)		3.71±0.22 ^a (100)	12.13±0.89 ^c (63.63)	8.70±1.47 ^b (70)
Number of bouts	M	3.52±0.28	4.25±0.37	4.56±0.58
	E	3.41±0.30	4.20±0.40	4.58±0.57
	Average	3.47±0.29	4.23±0.38	4.57±0.57
Inter-suckling	M	(11.30)	(51.04)	(71.33)
	E	(11.68)	(67.13)	(69.33)
	Average	(11.49)	(59.08)	(70.33)
Bellowing	M	1.80±0.18 ^{ab} (18.25)	1.36±0.13 ^a (30.30)	2.44±0.40 ^b (40.76)
	E	1.54±0.15 ^a (18.25)	1.43±0.17 ^a (27.27)	2.54±0.37 ^b (44.16)
	Average	1.67±0.14 ^a (18.25)	1.40±0.13 ^a (28.78)	2.49±0.36 ^b (42.46)
Tail wagging (sec)	M	106.82±15.51(90.95)	93.33±6.16(100)	76.20±7.16(100)
	E	107.76±15.29(100)	96.66±6.61(100)	77.20±7.69(100)
	Average	107.29±15.38(95.47)	95.00±6.34(100)	76.70±7.42(100)
Defecation (sec)	M	28.24±5.74(86.67)	29.12±4.27(78.18)	28.90±1.09(84)
	E	27.91±0.92(80.04)	25.39±1.11(62.42)	25.31±1.00(79.93)
	Average	28.08±0.46(83.35)	27.26±0.68(70.30)	27.11±0.90(81.96)
Urination (sec)	M	34.04±1.52 ^b (36.07)	28.68±1.71 ^a (34.54)	32.80±0.93 ^{ab} (45.33)
	E	28.57±1.22(27.14)	27.53±1.39(30.90)	29.70±0.81(38.67)
	Average	31.31±1.13 ^b (31.60)	28.11±1.26 ^a (32.72)	31.25±0.75 ^{ab} (41.96)
Suckling instinct score	M	1.22±0.06 ^a	1.28±0.04 ^a	1.68±0.18 ^b
	E	1.15±0.04 ^a	1.24±0.04 ^a	1.62±0.17 ^b
	Average	1.19±0.05 ^a	1.26±0.04 ^a	1.65±0.18 ^b
Total suckling score	M	1.49±0.07 ^a	2.11±0.06 ^b	2.27±0.24 ^b
	E	1.39±0.05 ^a	2.03±0.07 ^b	2.18±0.23 ^b
	Average	1.44±0.06 ^a	2.07±0.06 ^a	2.23±0.06 ^b

Means bearing different superscripts (a, b) within the row differ significantly ($P < 0.05$). Figure in parenthesis () indicates the percentage of calves showing the particular activity.

suckling behaviour in calves for Gr 1, Gr 2 and Gr 3 were 11.49, 59.08 and 70.33%. Comparatively higher proportion of calves involved in both weaned groups might be due to their inability to satisfy their natural suckling instinct as it was almost or fully satisfied in Gr 1. The inter-suckling proportion with respect to calves of suckling group is considered as equivalent as licking of dams by calves after suckling. The inter-suckling behaviour was observed in weaned calves after drinking milk and they were found licking or sucking of mouth of each other to satisfy their natural instinct as they were devoid of their respective dams in weaning pens. Although, inter-suckling between the calves was observed in the experiment, but Babu *et al.* (2004) concluded that the cross-sucking of mouth both during pre- and post-milk feeding period was significantly higher in individually housed calves than group housed calves. Nema and Wolfgang (2001) reported that inter-suckling in dairy calves are observed highest in farm when restricted availability of feed which is common around feeding.

Bellowing: The overall average bellowing frequency was significantly ($P<0.05$) higher in Gr 3 than Gr 1 and Gr 2; however Gr 1 and Gr 2 were not significantly different from each other. The higher bellowing frequency in Gr 3 might be due separation of calf from its dam after well-established relation. The proportion of showing this activity in Gr 1, Gr 2 and Gr 3 were 18.25, 28.78 and 42.46 %. Bellowing percentage was observed lesser in Gr 1 in which suckled calves which had complete social interaction between calf and dam. In context to the weaned calves, similar findings were reported by Loberg *et al.* (2008) compared with pre-weaning calves and concluded that other behaviour activities along with higher vocalizations were observed to reunite with their dams.

Tail wagging: The overall average tail wagging time (sec) while suckling or drinking was not significantly different among the groups. The proportion of calves showing this activity among the groups was also similar which indicated that tail wagging is one of the very common activities during milk suckling of drinking by calves.

Defecation: The overall average defecation time was not significantly different among the groups. The average proportion of defecation during suckling or drinking time in Gr 1, Gr 2 and Gr 3 were 83.35, 70.30 and 81.96%. Defecation in calves was mostly observed before start of suckling or drinking activity which indicated normal eliminative behaviour activity of calves before feeding.

Urination: The overall average urination time was significantly ($P<0.05$) higher in Gr 1 than Gr 2; however Gr 3 was not significantly different from Gr 1 or Gr 2. The average proportion of urination during suckling or drinking time in Gr 1, Gr 2 and Gr 3 were 31.60, 32.72 and 41.96%. Urination in calves was mostly observed before start of suckling or drinking activity which indicates normal eliminative behaviour activity of calves before feeding.

Suckling or drinking instinct score: The overall average suckling or drinking instinct score in Gr 3 (1.65 ± 0.18) was

significantly ($P<0.05$) higher than Gr 1 (1.19 ± 0.05) and Gr 2 (1.26 ± 0.04). The higher instinct score in Gr 3 indicated that calves spent longer time to start milk consumption after offering milk to them. Suckling/drinking instinct score in Gr 1 and Gr 2 was not significantly different from each other (Table 4). Suckling calves in Gr 1 started milk suckling immediately when they were allowed to suckle. Suckling or drinking instinct reflected the interest and desire to consume milk once the same is offered to the calves.

Total suckling or drinking score: The overall average suckling or drinking score was significantly ($P<0.05$) higher in Gr 3 (2.23 ± 0.06) than Gr 1 (1.44 ± 0.06) and Gr 2 (2.07 ± 0.06). The suckling score between Gr 1 and Gr 2 were not significant to each other (Table 4). The higher suckling score in Gr 2 and Gr 3 indicated that calves in weaned groups need longer assistance or learning time and had taken comparatively longer time to start milk consumption after offering milk to them.

From the present study, it was concluded that success of weaning practice more or less depended on behaviour of calves. The weaning management in buffalo could be useful to promote clean milk production and to get other established benefits of weaning similar to dairy cattle.

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