



Success rate, growth performance and feed efficiency of buffalo calves reared at different feeding programs under semi-intensive systems of rearing

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Early weaning of newborn calves encourages rapid development of rumen due to transition from liquid to solid feeds (Garnsworthy 2005). In milch buffalo breeds, if weaning system is practiced it may also give the significant advantages as seen in dairy calf weaning. One of the reasons for not weaning buffalo calves at birth or mid of lactation is due to fear of letdown problem by virtue of strong maternal instinct in buffaloes. Critical period for survival of buffalo calves is first month of age. Hence, if the calves are weaned after 1 month, the survivability of weaned calf may increase even on low milk intake in poor learners due to possible switching from liquid to solid diets. Keeping all in view, the present study was undertaken to compare the success rate, growth performance, dry matter intake and feed efficiency of Murrah buffalo calves due to different feeding programs versus suckling method under semi-intensive systems of rearing.

The experiment was conducted on Murrah buffalo calves at Cattle and Buffalo Farm of Indian Veterinary Research Institute (IVRI), Izatnagar. All newly born calves were randomly allocated to one of the following 3 groups, viz. group 1/Gr-1: suckling calves, Group 2/Gr-2: calves weaned at birth and group- 3/Gr- 3: calves weaned at 45th day of age. Initially 14 calves were selected in each group, but owing to few cases of weaning failures due to poor feeding temperament, the final number of calves studied in group- 2 and group- 3 were 11 and 10 respectively. The experiment was carried out from September 2011 to February 2012. All parameters were recorded from birth to 3 months of age. The calves were distributed alternately among the groups to reduce the effect of season and duration of allocation on their performance. All calves were housed individually in well ventilated, clean and dry concrete floored pens and were let loose for 6 h daily during the day time (from 9 AM to 3 PM) in an open paddock for exercise and to facilitate routine works at calf pens. All preventive

measures were taken to ensure proper health of calves throughout the experimental period including protection from cold wind.

Gr-1: All calves (14) were allowed to suckle from their respective dams twice a day from birth to 90 days of age. Each calf was fed colostrum from its own dam within 30 min after birth for first 3 days @ 10% of live body weight and later they were allowed to suckle respective dams twice daily during the milking hours. All calves were provided with good quality calf starter and chopped green fodder available during the study from 16th day on *ad lib.* basis.

Gr-2: Calves (11) were weaned immediately after birth. Each calf was fed on colostrum of its own dam within 30 min after birth twice daily for first 3 days of age @ 10% of body weight. From fourth day onwards, calves were fed by pail feeding of whole milk till 90 days of age. Amount of whole milk given to the calves were adjusted as per their fortnightly body weight. The feeding schedule of weaned calves is presented in Table 1.

Gr- 3: Calves (10) were allowed to suckle from their respective dams for 44 days of age (similar to group-1) and thereafter weaned at 45th day. All calves were fed whole milk by pail feeding method based on body weight and age of calves as similar to Gr-2.

Body weight of calves (kg) was recorded at fortnightly interval from birth to 90 days and body measurements (cm) were also recorded simultaneously as per the standard procedure. Milk intake (kg) of suckling calves was recorded by taking the difference of post-feeding and pre-feeding body weights of calves in each milking. Dry matter intake (DMI) of calves was estimated based on fresh matter intake from feeds (liquid milk, calf starter and roughages). Proximate analysis of feed samples was carried out every fortnight. Feed efficiency was calculated as weight gain of calves per unit kg of dry matter intake.

The standard statistical analytical procedures (Snedecor and Cochran 1994) were adopted for analysis of the generated data under study using SAS 9.2 version software. Statistical significance were checked by one way-way analysis of variance (ANOVA) at significance level of $P < 0.05$ and $P < 0.01$.

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Table 1. Feeding schedule of 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>

Table 2. Mean $\pm$ SE of body weight (kg) of calves at fortnightly interval under different systems

Fortnights	Gr-1	Gr-2	Gr- 3
At birth	34.58 $\pm$ 0.84	32.66 $\pm$ 1.22	32.30 $\pm$ 0.95
1	39.11 $\pm$ 1.19	36.54 $\pm$ 1.33	38.10 $\pm$ 1.07
2	45.65 $\pm$ 1.30 ^b	40.58 $\pm$ 1.08 ^a	43.30 $\pm$ 0.88 ^{ab}
3	52.87 $\pm$ 1.54 ^b	47.65 $\pm$ 1.73 ^a	48.54 $\pm$ 1.09 ^{ab}
4	60.96 $\pm$ 1.96 ^b	53.95 $\pm$ 2.04 ^a	55.78 $\pm$ 1.65 ^{ab}
5	69.46 $\pm$ 2.15 ^b	61.98 $\pm$ 2.59 ^a	64.55 $\pm$ 1.40 ^{ab}
6	79.71 $\pm$ 2.42 ^B	69.51 $\pm$ 1.93 ^A	73.59 $\pm$ 1.11 ^A
<i>Body wt gain (kg)</i>			
1	4.52 $\pm$ 0.83	3.88 $\pm$ 0.61	5.80 $\pm$ 0.20
2	6.53 $\pm$ 0.68 ^b	4.03 $\pm$ 0.69 ^a	5.20 $\pm$ 0.72 ^{ab}
3	7.22 $\pm$ 0.66	7.06 $\pm$ 1.11	5.24 $\pm$ 0.59
4	8.08 $\pm$ 0.53	6.30 $\pm$ 0.85	7.24 $\pm$ 0.79
5	8.50 $\pm$ 0.61	8.03 $\pm$ 1.15	8.77 $\pm$ 0.76
6	10.24 $\pm$ 0.83	7.52 $\pm$ 1.09	9.04 $\pm$ 0.98
Total weight gain	45.12 $\pm$ 2.21 ^b	36.85 $\pm$ 1.95 ^a	41.29 $\pm$ 1.22 ^{ab}
<i>Average daily gain (kg)</i>			
1	0.301 $\pm$ 0.05	0.258 $\pm$ 0.04	0.386 $\pm$ 0.01
2	0.435 $\pm$ 0.04 ^b	0.269 $\pm$ 0.04 ^a	0.346 $\pm$ 0.04 ^{ab}
3	0.481 $\pm$ 0.04	0.471 $\pm$ 0.07	0.349 $\pm$ 0.03
4	0.539 $\pm$ 0.03	0.420 $\pm$ 0.05	0.482 $\pm$ 0.05
5	0.566 $\pm$ 0.04	0.535 $\pm$ 0.07	0.584 $\pm$ 0.05
6	0.682 $\pm$ 0.05 ^b	0.501 $\pm$ 0.07 ^a	0.602 $\pm$ 0.06 ^{ab}
Overall	0.501 $\pm$ 0.02 ^b	0.409 $\pm$ 0.02 ^a	0.458 $\pm$ 0.01 ^{ab}

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 ($P < 0.01$).

The mean birth weight (kg) of calves in Gr-1, Gr-2 and Gr-3 calves were statistically nonsignificant from each other (Table 2).

Similar trend was observed till first fortnight. The final body weight in Gr-1 was significantly ($P < 0.01$) higher than both of other groups (Gr-2 and Gr- 3). However, the mean body weights in Gr-2 and Gr- 3 (weaned groups) were nonsignificant from each other. Higher body weight in Gr-1 might be due to higher milk consumption through suckling. Among weaned groups, Gr- 3 showed better result which might be due to milk suckling by calves for first 45 days of life. The higher body weight in suckled calves as compared to weaned calves in the present study signifies high dry matter intake from whole milk in suckling group (Kantharaja 2011). Khoury *et al.* (1967) reported that in

buffalo calves body weight of early weaned calves were inferior to those of late weaned calves, which are in corroboration with our findings. However, contrary to the present findings, Sachan and Netke (1971) found no adverse effect on their growth, provided the calves were being offered good quality calf starter and green fodder. Gallego *et al.* (2011) observed higher weaning weight in buffalo calves spending longer post-milking time with their mother as compared with that of spending shorter time with their mother (restricted suckling).

Weight gain and average daily gain (kg)

The total body weight gain was significantly ($P < 0.05$) higher in Gr-1 than Gr-2 however, it was not significantly different from Gr-3 (Table 2). The body weight gain in Gr-2 and Gr-3 was not significantly different from each other. Similar trends were observed for fortnightly average daily gain of calves during the experimental period. Comparatively higher body weight gain in calves of Gr-1 might be due higher mean birth weight and higher milk consumption through suckling. The lowest growth in Gr-2 might be due to low milk intake by calves as initially some of the calves had shown difficulty in learning to drink milk by pail. Azim *et al.* (2011) observed better average weight gain in weaned than suckled buffalo calves. 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).

The average body length (BL) of calves at birth was significantly ($P < 0.05$) higher in Gr-1 than Gr-2, however it was not significantly different from Gr- 3. Throughout the experiment similar trend was observed. The final BL in Gr-

Table 3. Mean $\pm$ SE of feed efficiency (weight gain /unit DMI) of calves

Fortnights	Gr-1	Gr-2	Gr- 3
1	0.607 $\pm$ 0.10	0.615 $\pm$ 0.09	0.778 $\pm$ 0.02
2	0.734 $\pm$ 0.07 ^b	0.449 $\pm$ 0.07 ^a	0.604 $\pm$ 0.08 ^{ab}
3	0.588 $\pm$ 0.05	0.546 $\pm$ 0.08	0.439 $\pm$ 0.04
IV	0.586 $\pm$ 0.04	0.470 $\pm$ 0.06	0.504 $\pm$ 0.05
V	0.507 $\pm$ 0.03	0.656 $\pm$ 0.09	0.661 $\pm$ 0.06
VI	0.525 $\pm$ 0.04	0.523 $\pm$ 0.07	0.587 $\pm$ 0.07
Overall	0.591 $\pm$ 0.03	0.543 $\pm$ 0.03	0.596 $\pm$ 0.01

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

1 was significantly ($P < 0.05$) higher than Gr-2 and Gr-3, however there was no significant difference between Gr-2 and Gr-3. Significantly higher fortnightly BL in calves of Gr-1 might be due to higher weight gain in the corresponding group than calves of other groups. Similar to body length, trends for height at withers and heart girth of calves were similar in all groups. Similar to the present finding, Kantharaja (2011) reported significantly ($P < 0.01$) higher body lengths of buffalo calves in suckling than weaned counterparts. The higher heart girth and height at wither of calves in suckling group reflects better growth due to higher milk consumption. Krohn (2001) also reported more increase in heart girth in suckled over weaned calves due to limited milk consumption at the end of the pre-weaning period.

Dry matter intake (DMI): The overall average daily DMI in Gr-1 was significantly ($P < 0.01$) higher (0.873 ± 0.01 kg) than Gr-2 (0.759 ± 0.01 kg) and Gr-3 (0.791 ± 0.00 kg), however there was no significant difference between Gr-2 and Gr-3. Higher DMI in suckling than weaned calves might be due to more dependency on milk in suckled calves being milk the principal feed whereas comparatively lesser milk intake in both Gr-2 and Gr-3 as per feeding programs. The dry matter intake was significantly higher in suckling than weaned calves in spite of providing complete whole buffalo milk to all calves. Kantharaja (2011) also reported higher feed intake through whole milk in suckling than weaned counterparts. Contrary to present findings, Azim *et al.* (2011) reported significantly higher DMI in late weaned calves than early weaned buffalo calves.

Feed efficiency (FE): The feed efficiency of calves was not significant among the groups (Table 3), except in second fortnight, where feed efficiency was significantly ($P < 0.05$) higher in Gr-1 than Gr-2.

The higher feed efficiency in Gr-3 at second fortnight could be attributed to significant difference in body weight gain in respective fortnight. The feed efficiency in calves weaned at 45th day of age was higher in the present study, however it was nonsignificant between suckling and weaned groups. Earlier studies (Ranjhan *et al.* 1972, Garg and Gill 1974) concluded that the reduction in the amount of milk in the early stage of development of calves had no adverse effect on their feed conversion efficiency even being offered on good quality calf starter and green fodder. Ahmad *et al.* (2004) reported that calf starter feeding in early weaned calves showed better results in terms of weight gain and feed efficiency. Conversely, Azim *et al.* (2011) reported that feed efficiency was significantly ($P < 0.01$) superior milk replacer fed group in early weaned calves than late weaned calves. Story *et al.* (2000) concluded that early weaned calves had better feed efficiency and growth performance than the non-weaned counterparts.

From the present study it could be concluded that feed conversion efficiency was superior in calves weaned at 45th day of age and had better growth performance than weaning at birth. However, the growth performance of calves was found higher in natural suckling than weaned. Therefore,

weaning in buffalo calves can save precious buffalo milk for public consumption and add profitability to the dairy farmers.

SUMMARY

The present study was carried out to compare the success rate, growth performance, and feed efficiency of Murrah buffalo calves reared at different feeding programs under semi-intensive systems of rearing. Calves were selected and distributed equally into group-1: suckling calves, group-2: calves weaned at birth and group-3: calves weaned at 45th day of age. The average daily gain of calves in suckling was significantly higher than calves weaned at birth but nonsignificant from calves weaned at 45th day. The body length, height at withers and heart girth of calves in suckling group was significantly higher than both the weaned groups. The average daily dry matter intake in suckling calves was significantly higher than weaned calves. The feed efficiency in 45th day weaned calves was higher but nonsignificant from suckling or weaned at birth. Buffalo calves could be weaned at birth and at 45th day of life without affecting growth performance but with lesser success rate of weaning.

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