Effect of age of calf on suckling behaviour and other behavioural activities of Zebu and crossbred calves during restricted suckling periods

S.M. Das a,b, Ingrid Redbo a,*, Hans Wiktorsson a

a Department of Animal Nutrition and Management, Kungsangens Research Center, Swedish University of Agricultural Sciences, P.O. Box 7024, 750 07 Uppsala, Sweden
b Livestock Production Research Institute, P.O. Box 202, Mpwapwa, Tanzania

Accepted 14 October 1999

Abstract

The objective of this study was to investigate the effect of age of calf on the behaviour of Zebu and crossbred calves during restricted suckling (RS) periods. The behaviours of 20 Zebu and 16 crossbred calves were recorded during two 30-min sessions each day after milking when the calves and their dams were brought together in a group for suckling. This was made for a time period of 2 weeks/month for 6 months postpartum.

The total suckling duration was significantly longer in Zebu calves (11.8 ± 0.19 min) compared to the crossbred calves (9.4 ± 0.19 min), but decreased significantly in both breeds with increasing age from 1 to 6 months. The number of suckling bouts decreased from a mean of 3.8 at 1 month of age to 1.1 at 6 month (P < 0.05). The duration of each suckling bout decreased significantly from a mean of 3.5 ± 0.15 min at 1 month of age to 1.6 ± 0.01 min at 6 months (< 0.05). The frequency of crossbred calves cross-suckling (3.7%) was significantly higher than that of the Zebu calves (1.9%; P < 0.05). The frequency of calves cross-suckling decreased significantly from 4.2% at 1 month of age to 2.3% at 6 months. The duration and number of bouts of cross-suckling was significantly higher in the crossbred calves (duration 0.9 ± 0.06 min; bouts 3, 7) than in the Zebu calves (duration 0.5 ± 0.06 min; bouts 2, 7) and decreased with increasing age of calf. The duration and number of bouts of inter-sucking was significantly higher in the crossbred calves (duration 0.6 ± 0.07 min; bouts 1, 6) than in the Zebu calves (duration 0.1 ± 0.04 min; bouts 0, 5) and decreased with increasing age of calf. Exploration increased in duration as the
calves increased in age from 1 to 6 months ($P < 0.05$). The duration of play increased significantly with the increase in age of calf from 1 to 6 months, and occurred mainly after nursing. © 2000 Elsevier Science B.V. All rights reserved.

Keywords: Cattle-feeding; Nutrition suckling; Age influence; Breed influence

1. Introduction

In many tropical countries it is common to practice restricted suckling (RS), where the calf is allowed to suckle the residual milk from a cow for a fixed period after each milking. The Zebu cows used for dairy production in the tropical countries, generally require the presence of their calf for milk letdown. The milk yield of Zebu cows have also been shown to be lower than that of crossbred cows under RS management (Das et al., 1999), which may influence the suckling patterns in calves. Also, the breed of the cow may affect the daily milk yield, a factor that has been shown to influence the suckling pattern of calves (Day et al., 1987; Das et al., 1999, unpublished).

Several studies have shown that total suckling duration per day decreased with increase in age of calf (Reinhardt and Reinhardt, 1981; Vitale et al., 1986) or stay relatively constant with age of calf (Kiley-Worthington and de la Plain, 1983; Lidfors, 1994). Reports have also shown that number of suckling bouts per day decreases with age of calf (e.g., Papini et al., 1983). These studies were mainly done on free-range cattle and calves had free access to suckling. There seems to be few published investigations on the behaviour of calves during group RS sessions. For instance, it is not known how frequently the calf suckles its dam or incidences of cross-suckling during RS. Age changes in these behaviours have not been documented. The RS system of dairy production has been reported to have considerable benefits in the tropical countries (e.g., Mai Van et al., 1997; Mejia et al., 1998) especially for the welfare of the calves and cows involved. This study is aimed to investigate the effect of age and breed of calf on suckling behaviour and other behavioural activities, such as cross-suckling and inter-suckling of Zebu and crossbred calves during group RS periods.

2. Material and methods

2.1. Animals and management of the cows

The study was conducted in 1995 at the dairy farm of the Livestock Production Research Institute, Mpwapwa, in central Tanzania. Thirty-six cows (4–8 years of age), 20 Zebu and 16 crossbred, of which 18 calved in the wet season and 18 in the dry season were used in the study. The sex ratio of the calves born was 19 males and 17 females. The Zebu consisted of the Mpwapwa breed (Das et al., 1986) and Sahiwal cattle, while the crossbred cattle were of $Bos taurus \times$ Mpwapwa crosses, having 35% of $B. taurus$ genes of dairy breeds.
Calves remained with their dams in the fenced calving-paddock for the first 5 days after birth to get colostrum and to establish maternal bonding, thereafter the 36 calves were separated from their dams and reared in a grazing paddock near the milking shed. Contact between calves and their dams occurred only during the RS periods in the morning and afternoon. The management of restricted suckled calves and their dams has been described in a parallel study by Das et al. (1999).

The cows were hand-milked twice daily at 0600 and 1400 h and their yield recorded at each milking. The calves were used to stimulate milk letdown by sucking each of the cow’s teats for a few seconds before the hand milking of the cows. For the first 90 days, the milk in the right hindquarter of the udder was left to be consumed by the calf later during the RS session, in addition to the residual milk in the other three quarters. After the milking of the cows was completed, the calves were allowed to suckle the cows in accordance with the routines described below. From day 91 postpartum, all teats were hand milked and the calves allowed to suckle the residual milk from all four quarters until weaning at 6 months of age. In between the two daily suckling periods, the calves were kept in a grazing paddock where they, in addition to the pasture, had free access to concentrate supplements.

2.2. RS procedure and data recording

Calves suckled their dams’ in a recording barn (20 × 10 m). After the morning milking was completed, three groups of 6 cows each were randomly formed out of the 18 cows available in each season. Each of the three subgroups of cows was brought into the recording barn in a random order, which was changed each day, after which the calves were allowed to enter the barn. Each subgroup of six cow–calf pairs was kept in the recording barn for a period of 30 min. The six recorders assisting in this study were trained for a period of 1 month so as to synchronise the recordings of the defined behaviours. Each recorder observed one focal cow–calf pair per 30-min session. The duration of all behavioural activities in each 30-min observation period were recorded. Video recordings were used as back up for occasional uncertain observations. Every cow–calf pair had neck collars with the same numbers for identification. The behavioural recordings were performed twice a day during these 30-min suckling periods for 2 successive weeks every month, from the first to the sixth month postpartum and in the wet and dry seasons, respectively. The total number of recordings per calf and 30-min session was 168. The milk production from the cows was recorded twice daily (AM, PM) and all calves were weighed once a month from birth to 6 months of age.

2.3. Behaviour activities recorded

The data recorded during each 30-min observation session were as follows:

Total suckling duration — Cumulative duration of calf suckling its dam throughout the 30-min observation time. This may include one or several suckling bouts.
Number of suckling bouts — Frequency of suckling. A suckling bout consisted of calf suckling one or more teats at the udder of the dam. Next bout was recorded when
the calf suckled again after a time lapse of $\leq 3$ min. 
Duration of a suckling bout — The duration started when the calf suckled the first teat to the completion of suckling, with calf moving away from the udder. 

The duration and number of bouts of the following behaviours was also measured:

- Cross-suckling — calf suckling from an alien dam.
- Inter-suckling — sucking by calf on other calves on any part of the body.
- Play behaviour with/without other calves — running and galloping alone or with other calves, encounters between calves, such as head to head contact or body contact of other calf or such as mounting.
- Social behaviour with the dam — calf sniffing, licking or rubbing against the dam.
- Social behaviour with alien dam — calf sniffing, licking or rubbing against the alien dam.
- Exploration — calf being away from its dam or other animals while sniffing (nosing) or licking walls, feed troughs, fittings or doors.
- Grooming — calf licking or scratching its own body.
- Lying — calf lying on the floor.
- Passive — calf being inactive while in standing position.
- Others — behaviour activities comprising of various other activities.

2.4. Statistical analysis of data 

The data on time measurements and bouts were aggregated within a period (AM, PM) and each month (age) for each individual animal, and the number of observations for each aggregation (averaged per period and per month) was 420. The data on suckling activity (total suckling duration and duration of suckling bout) was analysed by analysis of variance with breed, season, sex and age of calf as main factors. The other model analysed by analysis of variance (following repeated measures design) had animal identity, period (AM, PM) and age of calf as main factors. In all cases, the General Linear Model procedure of SAS (1996) was used. Variations in the mean values are shown as the standard error (S.E.). Correlation coefficients were derived between variables of interest. After testing for normal distribution, data that were not normally distributed (number of suckling bouts, duration and number of: cross-suckling, inter-suckling, play and social behaviour) were analysed by nonparametric statistics (Mann–Whitney U-test and Kruskal–Wallis test) of NPARiWAY (SAS, 1996) and Wilcoxon sign rank test. Results are given by means and standard deviations or standard errors.

3. Results 

Daily milk yield was significantly higher in the crossbred cows (5.3 kg) than in the Zebu cows (4.1 kg). Lactation milk yield was higher for cows calving in the wet than the cows calving in the dry season ($P < 0.05$). Calves born in wet season had
significantly higher liveweight and mean daily gain at 3 and 6 months of age. Crossbred calves had significantly faster growth rates, 331.8 ± 7.5 g from birth to 3 months of age and 313.0 ± 5.1 g from birth to weaning, compared to the growth rates of Zebu calves, 282.9 ± 6.9 g (birth to 3 months) and 274.3 ± 4.7 g (birth to weaning). Differences between breeds of cows and seasons of calving in production and growth of calves has been reported recently (Das et al., 1999).

3.1. Suckling behaviour

Mean total suckling duration at 1 month of age and 6 months of age averaged 15.5 ± 0.35 and 7.3 ± 0.11 min, respectively. Total suckling duration in both Zebu and crossbred calves decreased significantly as the calves increased from 1 to 6 months of age (Fig. 1). The mean number of suckling bouts decreased significantly from 1 to 6 months of age (Fig. 2). Overall duration of each suckling bout averaged 2.5 ± 0.03 min and decreased (P < 0.05) as the age of the calf increased from 1 to 6 months of age (Fig. 2). The Zebu calves had a significantly longer total duration of suckling than the crossbred calves, 11.8 ± 0.19 min compared to 9.4 ± 0.19 min. The Zebu calves also had a significantly higher number of suckling bouts (2.8 ± 0.42 vs. 2.2 ± 0.42, P < 0.05) and a longer duration (2.8 ± 0.03 vs. 2.3 ± 0.03 min, P < 0.05) of suckling bouts than the crossbred calves (Fig. 2). The result on differences in suckling behaviour between the breed types (i.e., Zebu and crossbred cow–calves pairs) has been reported recently in a parallel study (Das et al., 1999, unpublished). Sex of the calf, season of birth and time of day (AM, PM) did not significantly affect the total suckling duration, number of suckling bouts and duration of each bout.

Total suckling duration was significantly correlated with daily milk yield of the cow (r = 0.19, n = 36, P < 0.05). There was a significant positive correlation between total suckling duration and weight of the calf at 1 month (r = 0.53, n = 36, P < 0.01) and at 2 months of age (r = 0.37, n = 36, P < 0.05).

![Fig. 1. Mean total suckling duration (min) of zebu and crossbred calves from 1 to 6 of age (n = 36 per age; *P < 0.05 or ns — differences between two subsequent ages within a breed line).](image-url)
Fig. 2. Mean number (±1S.D.) and duration (±S.E.) of suckling bouts per observation time (30 min) of calves from birth to 6 months postpartum (n = 36, *P < 0.5 between two subsequent ages; No. of bouts — Wilcoxon test; duration of bout — t-test).

3.2. Cross-suckling and inter-suckling

The frequency of crossbred calves cross-suckling per observation time was significantly higher than that of the Zebu calves (Table 1). Frequency of cross-suckling decreased as the calf increased in age from 1 month (4.2%) to 6 months (2.3%) of age (P < 0.05, Kruskal–Wallis test for six age groups). Cross-suckling was of longer duration per observation time in crossbred calves compared to Zebu calves (P < 0.05, Table 1).

Table 1
Frequency (%) of calves cross-suckling and inter-suckling per observation time (30 min). Figures with different superscripts within a column of a factor class for a behaviour variable are significantly different: (P < 0.05, Breed—Mann–Whitney U-test, n = 20 Zebu, 16 crossbred)

<table>
<thead>
<tr>
<th>Factor</th>
<th>Cross suckling</th>
<th>Inter-sucking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crossbred</td>
<td>3.7&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.6&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Zebu</td>
<td>2.2&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.5&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Age&lt;sup&gt;*&lt;/sup&gt; (month)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>4.2&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.7&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>2</td>
<td>3.9&lt;sup&gt;a&lt;/sup&gt;</td>
<td>1.6&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>3</td>
<td>3.1&lt;sup&gt;b&lt;/sup&gt;</td>
<td>1.1&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>4</td>
<td>2.8&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.6&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>5</td>
<td>2.4&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.4&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>6</td>
<td>2.2&lt;sup&gt;c&lt;/sup&gt;</td>
<td>0.3&lt;sup&gt;c&lt;/sup&gt;</td>
</tr>
<tr>
<td>χ²-Value</td>
<td>65.46</td>
<td>82.62</td>
</tr>
</tbody>
</table>

<sup>*</sup>*P < 0.05, Age — Kruskal–Wallis test, χ²-value = Chi-square approximation of Kruskal–Wallis test, df = 5, n = 36 per age group.
Table 2). Older calves of both breeds (6 months) had decreased duration of cross-suckling than calves of younger age ($P < 0.05$; Table 2). Mean number of bouts of cross-suckling per observation time were significantly higher in crossbred calves (2.7) than in the Zebu calves (1.2, $P < 0.05$, Mann–Whitney $U$-test). The duration of suckling alien dam was positively correlated with the weight of the calf (mean: crossbred, 29.7 kg, and Zebu 24.2 kg) at 1 month of age ($r = 0.35$, $n = 36$, $P < 0.05$). Calves with higher weights had longer duration of cross-suckling compared to the calves with lower weights at 1 month of age.

Incidences of inter-suckling between the calves was rarely observed and consisted mainly of sucking the ears, udder of female calves and on the navel area but no observation was recorded of sucking prepucce or other areas. The frequency of crossbred calves inter-suckling per 30-min observation time was higher than that of the Zebu calves (Table 1). Frequency of calves inter-suckling per observation time significantly decreased as the calves increased in age (Table 1). Crossbred calves spent longer time suckling on other calves per observation time than the Zebu calves (Table 2), and had also significantly ($P < 0.05$) more bouts (1.6) of inter-suckling than the Zebu calves had (0.5).

### 3.3. Playing and social behaviour

Play was usually observed after suckling was over. The duration of calves playing alone or with other calves increased as the calves increased in age from 1 to 6 months, but there was no difference between Zebu and crossbred calves (Table 2). Duration of play was positively correlated with the weaning weight of calf ($r = 0.57$, $n = 36$).

<table>
<thead>
<tr>
<th>Factor</th>
<th>Cross suckling</th>
<th>Inter-sucking</th>
<th>Playing</th>
<th>Social behaviour (dam)</th>
<th>Social behaviour (alien dam)</th>
<th>Exploration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crossbred</td>
<td>0.9$^a$</td>
<td>0.6$^a$</td>
<td>1.7$^a$</td>
<td>1.9$^a$</td>
<td>1.1$^a$</td>
<td>5.1$^a$</td>
</tr>
<tr>
<td>Zebu</td>
<td>0.4$^b$</td>
<td>0.1$^b$</td>
<td>1.7$^a$</td>
<td>1.9$^a$</td>
<td>0.8$^b$</td>
<td>4.7$^a$</td>
</tr>
<tr>
<td>Age$^a$ (month)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1.2$^a$</td>
<td>0.7$^a$</td>
<td>0.4$^a$</td>
<td>1.7$^a$</td>
<td>1.1$^a$</td>
<td>2.6$^a$</td>
</tr>
<tr>
<td>2</td>
<td>0.8$^b$</td>
<td>0.6$^a$</td>
<td>0.5$^a$</td>
<td>1.9$^a$</td>
<td>0.9$^a$</td>
<td>3.1$^a$</td>
</tr>
<tr>
<td>3</td>
<td>0.5$^c$</td>
<td>0.5$^a$</td>
<td>1.1$^b$</td>
<td>2.3$^b$</td>
<td>0.9$^a$</td>
<td>4.2$^b$</td>
</tr>
<tr>
<td>4</td>
<td>0.5$^c$</td>
<td>0.2$^b$</td>
<td>2.1$^c$</td>
<td>2.5$^b$</td>
<td>1.0$^a$</td>
<td>5.5$^c$</td>
</tr>
<tr>
<td>5</td>
<td>0.4$^c$</td>
<td>0.2$^b$</td>
<td>2.6$^c$</td>
<td>1.6$^a$</td>
<td>0.9$^a$</td>
<td>6.8$^d$</td>
</tr>
<tr>
<td>6</td>
<td>0.4$^c$</td>
<td>0.1$^b$</td>
<td>3.4$^c$</td>
<td>1.3$^c$</td>
<td>1.1$^a$</td>
<td>7.2$^d$</td>
</tr>
<tr>
<td>$\chi^2$-Value</td>
<td>37.92</td>
<td>43.65</td>
<td>128.51</td>
<td>80.59</td>
<td>9.66</td>
<td>115.64</td>
</tr>
</tbody>
</table>

* $P < 0.05$, Age — Kruskal–Wallis test, $\chi^2$-value = Chi-square approximation of Kruskal–Wallis test, $df = 5$, $n = 36$ per age group.
The duration of calf socialisation with dam increased significantly from 1 to 4 months of age, thereafter decreased at 6 months of age (Table 2). The duration of socialisation with dams was positively correlated with the daily milk yield of dams ($r = 0.45, n = 36, P < 0.01$) and with suckling duration ($r = 0.26, n = 36, P < 0.05$). Crossbred calves spent longer time on social activity with alien dam compared to the Zebu calves ($P < 0.05$, Mann–Whitney U-test, Table 2).

3.4. Exploration

Most of the calves in the study showed exploration behaviour, which occurred mainly after suckling was completed. Only in a few instances (less than five observations) did exploration occur before suckling. The duration of exploration increased significantly from 2.6 min at 1 month to 7.2 min at 6 months of age (Table 2). Duration of exploration was positively correlated with weaning weight of calf ($r = 0.43, n = 36, P < 0.01$).

4. Discussion

In this study, a general pattern of suckling activity was found, showing that suckling duration and frequency decreases with age. This is in agreement with earlier studies such as the one by Day et al. (1987). In that study, it was shown that suckling behaviour of calves varied with level of milk yield in the dams at various stages of lactation. Calves that nursed dams with lower levels of milk production suckled more frequently and for longer duration per day than calves suckling dams with higher levels of milk production. Similarly, results found in our study showed that Zebu calves suckled for longer time and more frequent than the calves to the higher producing crossbred dams. In the RS system, duration of suckling bout averaged 2.6 min and frequency of suckling averaged 2.5 during 30-min observation time and both duration and frequency tended to decrease as the calf increased in age from 1 to 6 months of age. The duration of suckling bout is lower than that reported for the beef cows (e.g., Lewandrowski and Hurnik, 1983), whereby calves had access to their dams’ milk for longer periods compared to the present RS system. The decrease in suckling activity with the increase in age of calves in the present study may correspond to the increased alternative feeding, such as grazing and eating of concentrates between the RS periods (Das et al., 1999, unpublished). This decrease is similar to that in earlier reports in which cows stayed with their calves for longer periods (Hosokawa et al., 1992; Shimada et al., 1993). Also, the decrease in number of suckling bouts as well as the duration of each suckling bout with increasing age of calf in the present study is similar to that reported for free-range beef cattle (Reinhardt and Reinhardt, 1981; Vitale et al., 1986; Lidfors et al., 1994). In the latter study, Lidfors et al. observed that even though the duration of suckling in the beef calves decreased with increasing age of the calves, this was not related to the duration of those components of the suckling behaviour that involved milk transfer. The author suggested that the weaning period had started at 4 months of age based on the changed pattern of the nutritive suckling component. In our study, the growth rate of
the Zebu calves were lower than in the crossbred calves, even though the Zebu calves had a longer duration of suckling and a higher number of suckling bouts than the crossbred calves. The higher frequency and duration of suckling in the Zebu calves may indicate that Zebu cows could have been holding more milk for their calves, even though the actual amount of milk may have been insufficient for higher growth rates when compared to the crossbred calves in the similar RS system.

In this study, both cross-suckling, where a calf suckles an alien cow, and inter-suckling, where calves are sucking on other calves, were performed at very low levels during the periods of group nursing. The cross-suckling occurred mainly after the dam’s own calf had finished suckling. During the first 2 months, cross-suckling was performed by different calves and cows, while at later stages (fourth to sixth months), a tendency could be observed that the same calves and cows were engaged in cross-suckling. Cross-suckling tended to be reduced as the calves increased in age, which may be related to the decreased dependency on milk when grazing and eating of solid feeds increased with increasing age.

The short duration of cross-suckling found in our study may indicate that these sucklings merely were nonnutritious, even though the possibility for the alien calf to receive milk or not must have been influenced by the time interval since any preceding (real) suckling performed by the cow’s own calf.

Inter-sucking is principally a behaviour found in young bucket-fed calves that are separated from their dams and raised with close enough contact to allow sucking on each other. An important reason for the high incidence of inter-suckling in bucket-fed calves is probably the short duration of eating which follows the ingestion of a restricted amount of milk from a bucket (Lidfors, 1993; Veissier et al., 1998). Even when the buckets are equipped with artificial teats, the duration of a meal usually becomes much shorter than if the calf had been able to suckle a cow (Redbo, 1992). Thus, in the present study, we would have expected an absence of inter-suckling since all the calves had free access to their dams. Despite the low figures for inter-suckling in both breeds, the crossbred calves had a significantly higher level both of sucking on other calves as well as alien cows than the Zebu calves had. The incidences of post meal nonnutritive sucking on, e.g., other calves, have been shown to be reduced when meal duration is longer (Haley et al., 1998). The shorter duration of suckling in crossbred calves may have increased the risk of a continued high motivation for sucking when the suckling bout was ended. This would result in persistent search for stimuli to suck on such as alien cows or other calves. This may have been one contributing factor behind the higher levels of inter-suckling and cross-suckling in the crossbred calves. It has been demonstrated that the ingestion of milk plays an important role in stimulating sucking on a dry teat in calves (De Passillé et al., 1992). The crossbred calves most probably received more milk than the Zebu calves at each suckling, since the crossbred cows generally had a higher milk production (Das et al., 1999). It cannot be ruled out that such a higher milk ingestion, together with the lower suckling duration that was found in the crossbred calves compared to the Zebu calves, could have contributed to the higher incidences of inter-suckling found in the crossbred calves. Both the duration and frequency of cross-suckling and inter-suckling decreased with increasing age in the present study. The higher frequency of suckling, along with longer total suckling duration in younger calves
compared to that of the older calves, may have contributed to relatively higher incidences of inter-sucking in younger calves. Inter-sucking has been found in other studies to decrease considerably after weaning (e.g., Lidfors, 1993).

Apart from suckling behaviour, the calves in the present study were engaged in other behavioural activities, such that the calves spent on average 5.6% of the observation time playing while the mean number of bouts were 2.1 per observation time. This is in accordance with the report that duration of play behaviour in beef calves in group pens ranged from 2 to 6 min while the frequency ranged from 1 to 4 bouts for the 2-h observation time (Dannenmann et al., 1985). An increase in duration of exploration with increasing age of the calves that was found in the present study has been suggested to be linked to a general increase of active movements with age, leading to more time being spent on investigatory behaviours (Veissier et al., 1994). Increase in exploratory behaviour of calves with increasing age has also been reported recently. Calves reared in group pens increased exploration from 9.8 to 13.3 min at 150 and 240 days, respectively, (See et al., 1998).

In conclusion, time spent on suckling activity by the Zebu and crossbred calves during RS decreased from 50% to 25% as the calves increased in age from 1 to 6 months. Also, the duration and incidence of cross-suckling and inter-sucking decreased with the increasing age of the calf and were also significantly affected by the breed of calf.

Acknowledgements

The authors are grateful to Swedish Agency for Research Cooperation (SAREC) for funding this study and to the Ministry of Agriculture (Tanzania) for granting permission to conduct this study. The authors are thankful to the staff at Swedish Agriculture University, Uppsala, and at Livestock Production Research Institute, Mpwapwa, for assisting in providing materials for the study.

References


