

REARING HOLSTEIN FRIESIAN AND BROWN SWISS CALVES ON NURSE COWS

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A comparison was made of the performance of Holstein Friesian (HF) and Brown Swiss (BS) calves reared on nurse cows or bucket-fed whole milk from birth to 9 weeks of age. Twelve HF and twelve BS calves were used, assigned at random to the two rearing systems. Pregnant cows with more than 10 months in lactation and mean production of less than 6.0 litres/day were used as nurse cows. Bucket-reared calves received 196 litres of milk over 9 weeks. The experiment started on the fourth day after birth. A covariance analysis was carried out on the weight gains, using as sources of variation sex, rearing system, breed and the first and second order interactions, with birth weight as a covariable. The mean adjusted weight gains were 0.680, 0.675, 0.630 and 0.480 kg/day for the HF and BS breeds in the suckling and bucket systems, respectively. The suckling system produced heavier ($P < 0.05$) weight gains than the bucket system (0.677 versus 0.555 kg/day). No effect of sex or breed was observed, although the advantage of the suckling system was important ($P < 0.05$) with the PS calves. The incidence of diarrhea was 2.5 times lower in the suckled group which consumed 82% more milk and 124% less concentrate than the bucket-fed group. The suckled group had lower variable costs in medicines and concentrates, besides the 196 litres of milk which was saved. Without increasing labour costs, the use of foster mothers made possible the utilisation of milk which would otherwise not have been used. The use of nurse cows offers an alternative for improving production efficiency in intensive systems in the tropics, where calving intervals exceed 12 months.

Key words: Rearing system, calves, nurse cows, bucket

High death rates, especially during the first days of life, are one of the major problems affecting milk production in the tropics (Vaccaro, 1974; Vaccaro et al 1983). Although the magnitude of the losses is poorly documented, it is accepted that they are heavier in animals of European breeds (Vaccaro 1974) and, among these, the Brown Swiss has higher mortality rates than the Holstein (McDowell 1982). The principal causes of loss in calves are respiratory and gastrointestinal diseases (Vaccaro 1974; Vaccaro et al 1983). The use of restricted suckling has been shown to increase the amount of milk produced by the cow, satisfactory weight gains by the calf (Ugarte and Preston 1972; Paredes et al 1981b) and lower incidence of digestive problems (Preston and Ugarte 1972; Guevara 1982). Satisfactory results from rearing calves on nurse cows have been reported from temperate zones by Everitt and Phillips (1971) and Kaiser and O'Neill (1975) and by Preston and Ugarte (1972), Ugarte et al (1974); and Ugarte (1978) from the tropics. An additional advantage of the system is that it permits the economical use of cows which have calving intervals exceeding 12 months, a situation which is frequent in European breeds in the tropics and which otherwise results in prolonged dry periods or periods of very low milk yield.

The objective of this study was to compare the traditional system of rearing Holstein and Brown Swiss calves with whole milk fed in buckets for 9 weeks, with a system of rearing them on nurse cows.

Materials and Methods

The experiment was carried out in the herd of the Facultad de Agronomía of the Universidad Central de Venezuela, Maracaib, at an altitude of 452 m above sea level. The mean annual temperature is 24.5°C (maximum 30°C and minimum of 23°C), with average rainfall approximately 850 mm and relative humidity between 65 and 80 %. Twelve Holstein Friesian (HF) and twelve Brown Swiss (BS) calves of both sexes were used, assigned as they were born to either treatment. Five HF and 3 BS cows were used as foster mothers, all of which were in the final stages of lactation, producing less than 6 litres milk/day and pregnant. The calves were housed in individual shaded pens with tubular metal separations (11 x 2 m), and floors of part concrete and part earth. The nurse cows were kept in a corral of 8 x 8 m, half of which was shaded, with a part concrete and part earthen floor. Calves stayed with their dams for 72 hours and were then separated into the individual pens. The experiment started on the fourth day after birth. Six calves of each breed were reared on whole milk fed from buckets and the other six of each breed reared with nurse cows. The calves fed whole milk received two equal feeds daily, with a total of 4 litres/day during the first four weeks, 3 litres/day for the next three weeks, 2 litres/day in the eighth and 1 litre/day in the ninth week, giving a total of 196 litres in the 9 weeks of the experiment. The calves reared on the nurse cows were taken to the cows' corrals in the morning and afternoon for 20 minutes each time. Each nurse cow fed one calf, but some cows were used successively to rear two calves. The calves received a pelleted concentrate of 20% crude protein after the tenth day of life. They were also given Bermuda grass (*Cynodon dactylon*) hay of poor quality ad libitum. The nurse cows were fed chopped elephant grass (*Pennisetum purpureum*) and 5 kg/day of a concentrate made up of 20% ground maize, 15% wheat bran, 15% sorghum flour, 10% soya meal, 20% sesame cake and 20% rice flour, which is the same ration fed to the dry cows in the herd.

The calves were vaccinated against pneumoenteritis on the 5th and 21st day of life and dosed for internal parasites at a month old. Diarrhea was controlled with terramycin pellets and antidiarrheic suspensions. The calves were weighed every seven days, before and after suckling in the one group and before consuming their bucket ration in the other group. The milk yield of the nurse cows was measured for three consecutive days before they entered the experiment and every seven days thereafter, using the difference in calf weights before and after suckling. Any cow which was found to be producing less than the calf should have been receiving according to the diet programmed for the bucket-fed animals, was eliminated and replaced by another.

Daily weight gains were analysed as a completely randomised 2³ factorial design, using breed, sex and rearing system as the sources of variation and birth weight as a covariable.

Results and Discussion

The analysis of covariance of mean weight gains showed there to be significant differences only due to system of rearing ($P < 0.05$). Table 1 summarises the mean weight gains according to breed in the two feeding

Table 1:

Mean daily liveweight gain (kg) according to breed and feeding system.

Breed	Feeding system*	
	Suckled	Bucket-fed
Holstein Friesian	0.680 ^a	0.630 ^a
Brown Swiss	0.65 ^a	0.480 ^b
Average for system	0.677 ^a	0.555 ^b

* Mean square error: 0.013.

The means accompanied by different letters are significantly different ($P < 0.05$)

systems. Calves reared on nurse cows gained 0.122 kg/day more than those reared with bucket feeding. The BS calves appeared to adapt less well than the H calves to bucket feeding and in most cases it was necessary to use plastic teats attached to the buckets. Even so, many of the BS had difficulty consuming the milk and wasted it. This partly explains the reduced weight gains of the BS calves which were bucket fed and the advantage of the suckled BS calves ($P < 0.05$). With the HF calves, in contrast, no difficulty was experienced in teaching them to drink directly from the buckets and no difference was found in daily weight gain between the bucket and suckling systems.

Table 2:

Total consumption of concentrates and milk according to feeding system and breed.

Breed	Feeding system			
	Suckled		Bucket-fed	
	Consumption		Consumption	
	Milk (litres)	Concentrate (kg)	Milk (litres)	Concentrate (kg)
Holstein Friesian	357.4	18.1	196	49.3
Brown Swiss	355.0	22.8	196	40.2

Table 2 summarises the consumption of milk and concentrates during the experimental period. The suckled calves consumed 82% more milk than those which were bucket fed. According to Gaya et al (1977), suckling prolongs the lactation and even increases the amount of milk produced. Small increases in dams' milk yield with the age of calves has also been reported by Ugarte (1978). The quantity of milk consumed in the present study by the suckled calves is greater than that reported for a multiple suckling system by Kaiser and Mullen (1976) and Ugarte et al (1974) of 25l litres up to weaning and 3.9 litres/day, respectively.

The concentrate intake averaged 0.78 and 0.64 kg/day for the HF and BS calves reared artificially, being 172 and 76% above that consumed by the suckled calves of the two breeds. L. Paredes (unpublished data) observed an inverse relationship between the consumption of milk and of concentrates in restricted suckling calves. The concentrate consumption of the bucket-fed animals was higher than the levels published by Butterworth and García (1972) and Guevara (1982) for calves of the same breeds.

For every kg of weight gain, the suckled calves consumed 2.63 litres more milk (8.34 versus 5.71 litres) but 0.81 kg less concentrates (0.48 versus 1.29 kg) than the bucket reared animals. There occurred, thus, the substitution of a purchased input by the production of milk which is not routinely utilised.

The weight gains obtained with the use of nurse cows are slightly inferior to those reported by Edwards (cited by De Alba, 1971) who recorded gains of 0.79 kg/day in a multiple suckling system in a temperate climate. Weight gains of 0.73 and 0.69 kg/day were reported by Kaiser and O'Neill (1975) and Everitt and Phillips (1971) in Australia and New Zealand, also in multiple suckling systems. However, results from tropical zones have been inferior to those reported in the present case. Thus, Preston and Ugarte (1972), Ugarte et al (1974) and Ugarte (1978) give gains of 0.40 and 0.45 kg/day for suckled calves. Using bucket rearing, Paredes et al (1981a) obtained weight gains of 0.501 kg/day up to five weeks of age, using 126 litres of milk, while Capriles (1975) reported 0.729 kg/day up to eight weeks of age using 280 litres of milk.

Health considerations and costs: Table 3 shows the frequency and type of diarrhea observed (semiliquid, liquid and bloody) in both systems, expressed in calf-day units. In the suckling systems, one HF calf presented semiliquid diarrhea for one day, 3 had liquid diarrhea for one day and none suffered from bloody diarrhea. The results for the bucket system may be interpreted in a similar fashion. Overall, the bucket reared calves presented 2.5 times as many calf-days with diarrhea than those which were suckled, although there was no difference between breeds ($\chi^2 = 3.11$). A greater frequency of semiliquid and liquid diarrhea cases was observed in both systems, with relative few cases of bloody diarrhea. Preston and Ugarte (1972) and Guevara (1982) reported a higher incidence of diarrhea in bucket-reared than in suckled calves.

Table 3:

Frequency (calf-days) and type of diarrhea, according to breed and feeding system.

Breed	System	Type of diarrhea			Total
		Semiliquid	Liquid	Bloody	
Holstein Friesian	Suckled	1	3	-	4
	Bucket-fed	4	13	2	19
Brown Swiss	Suckled	3	3	2	8
	Bucket-fed	2	9	-	11

Taking into account only the variable costs of medicine and concentrates, the suckling system gave a cost equivalent to US \$ 0.33/kg weight gain, compared with US \$ 0.90/kg for the bucket system. The lower cost of the suckling system was due to the lower consumption of concentrates and medicines. If the current price on the domestic market (US \$ 0.64/litre) is assigned to the milk consumed, the cost of the bucket rearing system is increased to US \$ 4.55/kg live weight. This increase does not apply to the suckling system because the milk would not otherwise have been used, since the milking of such low-yielding cows would not be economically justifiable in an intensive production system. The concentrate consumed by the nurse cows is not included in the economic evaluation since they would have been consuming the same amount had they been dry. It is possible that the body condition and weight of the nurse cows would have been better at their next calving had they not produced about 6 litres of milk daily for 78 days more, as was the case in the suckling system. Even so, no evidence that this was true has been detected in the herd so far and it is doubtful whether such an effect would outweigh the advantages of the system. Labour requirements should not be increased with the nurse cow system and may, in fact, be reduced once the facilities have been adapted accordingly.

The cows used as foster mothers in the present study had a mean calving interval of 18 months and a lactation period of, on average, 312 days. Thus, after having been used for suckling in the experiment during 78 days, they still had a dry period of 150 days to recuperate before their next calving. This was an abnormal group of cows with reproductive problems in a herd where the mean calving interval is about 14 months. In the average case, therefore, the cows could be used as nurse cows for two months after their lactation period of 10 months, without affecting their normal dry period of two months.

Despite the fact that difficulties have been reported with some cows in accepting calves other than their own (Preston and Willis, 1975), no problems were encountered in the present study either with the Holsteins or the Brown Swiss foster mothers. It was only necessary to tie the cow

up by the neck during suckling for the first two or three days after the introduction of the new calf. However, given the small number of cows used in the experiment, definite conclusions cannot be drawn in this regard.

Conclusions

The use as foster mothers of cows which are pregnant, have been in milk for over ten months, with calving intervals greater than 12 months and producing small quantities of milk, produced optimum weight gains in calves up to 9 weeks of age, with lower costs of concentrates and medicines and a saving of 196 litres of milk. The use of the suckling system was especially beneficial with Brown Swiss calves and avoided the problems commonly encountered with this breed in the first weeks of life. The conditions of intensive systems of milk production in the tropics lend themselves ideally to the adoption of this rearing system, thus contributing to an improvement in the efficiency of production.

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