3. Reproductive Performance of Crossbred Cows Developed for Milk Production in Semi-Arid Regions and The Effect of Feed Supplementation: An Interim report on early post partum activity in indigenous and crossbred cows – R6955

Evelyn Garwe and Peter JH Ball

Introduction

There is great interest in increasing milk production in the smallholder sector in Zimbabwe, especially in the drier parts of the country where cattle production is the major source of livelihood for the farmers. The reproductive performance of the indigenous and crossbred cows used for this purpose is poor, often with calving intervals as long as three years. The underlying causes of reproductive failure in these breeds are poorly understood and there have been very few studies into the possible causes. The project was aimed at addressing them.

Basic information on reproductive activity is being obtained through the medium of milk progesterone profiles. The purpose of the report is to present the initial findings on early post-partum ovarian cyclicity in indigenous and crossbred cows at Matopos Research Station.

Objective

The objective of the study was to monitor specific problems contributing to poor reproductive performance using milk progesterone profiles and to study the effect of breed and feed supplementation on the reproductive performance of indigenous and crossbred dairy cows.

Materials and Methods

Thirty-seven indigenous cows and 45 crossbred cows, of which 36 were F1 crosses and nine were backcrosses (F2), were used for the study, giving a total of 82 experimental cows. The indigenous cows were Tulis and Nkones. The F2 cows comprised of crosses between the Jersey bull and F1 cows. The indigenous and the backcrosses were all first calvers whilst the F1 crosses ranged from the first to fourth parity. The age of the cows ranged from two to six years.

Within each breed (indigenous; crossbred) cows were divided into control and treatment groups to evaluate the effect of feed supplementation. Control cows grazed natural rangeland, consisting of grasses and browse (basal diet). This is the basal diet commonly available in smallholder milk production systems in Zimbabwe. Treatment group cows were fed the basal diet supplemented with dairy meal at a flat rate of 2 kg per day. This is the type of diet that is currently recommended for use by smallholder farmers. Farmers favour flat rate feeding because of its simplicity.

The experiment thus encompassed two factors, namely breed and diet. The first factor had two levels (indigenous and Jersey crossbred cows) as did the second (basal diet and basal diet supplemented with dairy meal). Supplementary feeding was supplied for a minimum of 120 days post-calving and a maximum of 200 days.
The cows were milked once a day and milk yield was recorded at every milking. Calves

were allowed to run with their dams after milking until late afternoon when they were separated for the night. They were re-united after milking on the following day,

Milk samples were collected three times a week (every Monday, Wednesday and Friday) from all cows. The milk was thoroughly mixed and put in sample bottles containing potassium dichromate for preservation. The milk samples were stored in a refrigerator at 4^0C to await progesterone analysis. The concentration of progesterone in milk was determined by solid phase radio-immunoassay using a kit (Diagnostic Products Corporation, Los Angeles CA).

Progesterone profiles derived from the progesterone concentration data were used to obtain the interval to the resumption of ovarian activity (at least two consecutive milk progesterone levels of at least 3ng/mg) and to determine cyclical activity.

The cows were clearly marked for ease of identification and were observed for oestrus in the morning, during and after milking, and in the late afternoon. All observed heats were recorded.

The effects of feed supplementation and breed on milk yield and initiation of cyclicity were determined by the Chi-square Test.

Results

The data used for the results are from a total of 56 cows (18 indigenous and 38 crossbreds).

A much greater proportion of crossbred than indigenous cows displayed ovarian cyclicity by 120 days post partum. Cyclical behaviour was significantly influenced by breed ($p = 0.004$) as shown in table 1. The extent of the difference between breeds is highlighted; by the fact that seventy nine per cent of the crossbreeds cycling did so by day 60, whilst none of the indigenous cows started cycling before 99 days post-partum.

Table 1: The number of indigenous and crossbred cows cycling on not cycling by day 120 post-partum

	Number Cycling	Number not Cycling	Total	Chi-square
Indigenous	5	13	28	
Crossbred	26	12	38	
Total	31	25	56	8.164 ($p = 0.004$)

As may be expected, a higher proportion of supplemented than control cows started ovarian cycles in the post-partum period under study, as is shown in Table 2.

Table 2: The number of cows cycling or not cycling in relation to supplementation or control diet

	Number Cycling	Number not Cycling	Total	Chi-square
Supplemented	18	10	28	
Control	13	15	28	
Total	31	25	56	1.806 ($p = 0.179$)

The interaction between treatment and breed was significant (p = 0.012) as shown in Table 3.

Table 3: The number of indigenous and crossbred cows cycling or not cycling in response to supplementation or control diets (no supplement) by day 120.

	Number Cycling	No. not Cycling	Total	Chi-square
Crossbred Supplemented	14	6	20	
Crossbred Control	12	6	18	
Indigenous Supplemented	4	4	8	
Indigenous Control	1	9	10	
Total	31	25	56	11.08 (p = 0.012)

Although numbers are as yet too small to draw firm conclusions, it is interesting to note that seven out of eight (87%) of the backcrosses did not cycle by day 120 post partum. A higher proportion of cycling cows might be expected among those with a higher level of exotic blood.

Over all, oestrus detection was quite efficient, 69 per cent of the ovulations demonstrated in the profiles being "detected" by the herdsmen. Neither of the two ovulations that occurred in the indigenous cows was accompanied by observed heat but the numbers are too small to make meaningful comparisons with the crossbreeds.

Milk production was significantly higher in crossbred than in indigenous cows (P = 0.013). Diet did not have a significant effect on milk yield (P>0.05). The average daily milk yield for the two treatment groups is shown in Table 4.

Table 4: Average daily milk yield for crossbred and indigenous cows on supplemented or control diet.

	Yield (L/day $\pm$ SD)		Mean	SEM
	Supplemented cows	Control		
Indigenous	0.71$\pm$1.24	0.61 $\pm$ 1.24	0.66	
Crossbred	2.47 $\pm$ 1.24	2.37 $\pm$ 1.24	2.43	
Average	1.59	1.49	1.55	0.88

Discussion

These results, although preliminary, are of great interest in that they demonstrate a fundamental difference in ovarian cyclic activity between the indigenous breeds in the study and their exotic F1 crosses. The results showed that a significantly higher proportion of crossbred cows start ovarian activity much earlier after calving. As would be expected, the crossbreds produce more milk than indigenous cows, but this could be expected to suppress their ovarian activity. Supplementation appeared to have a positive effect in enhancing the onset of ovarian activity, which was not significant (P>0.05), possibly because the good

grazing season was beneficial to reproductive performance of all the cows. The effect was more marked in the indigenous animals.

Supplementation had no significant effect in improving milk production in either breed, again possibly because control cows yielded relatively well on the good grazing available in the 1997/8 season.

It appears as if backcrosses do not behave in the same manner as F1s, since the former took a long time to start cycling. Numbers of backcrosses are small, but this does suggest possible detrimental effects of including more exotic blood, or of back crossing *per se*, in crosses intended for use in dry areas.

Progesterone analyses will soon be complete for all cows, allowing conception rates and embryo/foetal loss rates to be estimated.

Comments and questions

Mr Chinembiri asked how the level of supplementation was arrived at.
Mrs Garwe explained that a feeding level of 2kg feed per cow per day was chosen after having looked at the resources available to the average smallholder farmer. It was further explained that yields from the indigenous cows were low because the milking technique used (milking the cows away from their calves) resulted in the cows not letting down their milk. Indigenous cows became over-conditioned, a possible cause of low reproductivity.

Dr Titterton asked whether the communal farmers in Irisvale had planned to use commercial feed.
Mrs Garwe replied that the use of commercial feeds was not a farmer initiative. She highlighted, however that the use of commercial feeds is advised by DDP when commercialisation of dairy production is introduced.

Mrs Maasdorp suggested that silages could replace the low levels of concentrates in the feed.
Dr Mutisi agreed adding that future work could be done in conjunction with the silage project.

Dr Richards pointed out that the study required cows to calve once a year when the average cow in semi-arid areas calves every second year. He questioned whether this was not expecting too much and suggested that perhaps the length of the milking period should be looked at.
Dr Ball replied that in general yearly calving resulted in a shortened life span for the cow but suggested that the opportunity cost of this was better than the money lost if the cow is dry for long periods.
Mrs Garwe added that the research team had been interested in finding out the potential calving rates of the cows, and the scope for exploiting this.

Dr Moyo asked at what point embryos were being lost after service.
Mrs Garwe reported that this occurred 30-100 days after service.

Dr Smith questioned how the research team intended to control breeding during the on farm

trials.
Mrs Garwe reported that on-station the cows were permitted to run freely with the bull, which is the case in communal areas.

Dr Derah noted that diseases also affect productive potential and asked about the measures being taken to prevent this from affecting the on-farm trials.
Mrs Garwe explained that the project was working closely with the Veterinary Department. Fortnightly lectures will be held for farmers, at which representatives of the Department will be present. She added that advice would be given to the farmers, on such subjects as deworming, although the project could not help in the purchasing of veterinary inputs.