THE INFLUENCE OF PLANE OF NUTRITION IMMEDIATELY POST-CALVING ON THE PERFORMANCE OF BEEF COWS

A. M. NICOL
Lincoln College, Canterbury

SUMMARY

The results of three experiments on the nutrition of the beef cow immediately post-calving are presented. Trial I compared a low plane of nutrition (body weight loss) for 40 days post-calving compared with a control group (weight gain) using two- and three-year-old cows. Low plane cows produced 10% less milk and were seven days later to first service than control cows but there was no significant difference in the weaning weights of the calves. Low plane calves grazed for longer. Trial II which was repeated over two years examined the effects of low plane for 22 days post-calving and detected no significant effect on any of the parameters measured.

INTRODUCTION

The manipulation of the nutritional status and consequently the liveweight of the beef cow, particularly during the later stages of pregnancy, is well accepted (Hight, 1966, 1968a, b; Scales and Stevenson, 1976). Although these authors have also examined the effects of post-calving nutrition, their treatments have been imposed either for the complete period from calving to mating (Scales and Stevenson, 1976) or from calving to weaning (Hight, 1968a). In practice, however, most breeding cows which are subjected to low levels of nutrition immediately after calving will experience a rising plane of nutrition at some stage during the spring as the rate of pasture production increases.

It is important that the effects of a short period of under-nutrition immediately post-calving are clearly understood in order to clarify whether scarce spring feed resources should be fed to the beef cow before or after calving.

This paper reports on a series of three trials investigating the effects of a low plane of nutrition for 22 or 40 days post-calving on the liveweight, milk production and breeding performance of beef cows, and on the growth of their calves.

ANIMALS AND METHODS

In each of the three trials, the cows (Angus and Angus cross) were randomized at calving to their respective post-calving feed-

ing level according to the age of the cow, calving date and nutritional treatment in the preceding year. Cows and calves were weighed regularly. The milk production of the cows was monitored at 21- to 28-day intervals and the milk analysed as described by Nicol (1976). Cows were mated to a Hereford bull fitted with a chin-ball marking harness and mating dates recorded.

TABLE 1: TREATMENTS, MEAN CALVING DATES AND COW AGE DISTRIBUTION FOR THE THREE TRIALS

Trial	*Year*	*No. of Cows/ Group*	*Treat-ments*	*Mean Calving Date ± S.D. (days)*	*Age of Cows* 2	3	4	5	6	7	8
I	1971-2	14	H	14.8 ± 19	6	8					
			L_{40}	12.8 ± 17							
II	1975-6	13	H	18.8 ± 15		2	2	3	3	3	
			L_{22}	21.8 ± 16							
III	1976-7	15	H	20.8 ± 15		2	2	2	3	3	3
			L_{22}	18.8 ± 12							

Table 1 shows the treatments imposed, the mean calving dates, and the age of the cows used. The high plane (H) of nutrition post-calving involved adequate grazing of good spring pasture or greenfeed, not less than 10 cm long, while the low plane (L) group of cows grazed on pasture previously grazed closely to approximately 2 cm by other stock. During mid-pregnancy all cows had lost body weight, but had been on a rising plane of nutrition for the six weeks prior to calving.

In Trial I, observations on the behaviour of the cows and calves were made. The calf behaviour data have been presented previously (Nicol and Sharafeldin, 1975) but information on the grazing behaviour of the cows is presented here.

RESULTS

A summary of the results of all three trials is presented in Table 2. Trial I, which involved young cows, showed that a plane of nutrition over the first 40 days post-calving which caused a loss of liveweight (−0.40 kg/head/day), as opposed to a situation where the cows gained (+ 0.60 kg/head/day) over the same period, was reflected in a depression in milk production of the cows and a slightly slower growth rate in the calves (0.69 versus 0.83 kg/day for L_{40} and H calves, respectively). However, there was subsequently no significant difference in weaning weights. By Weaning (mid-December) compensatory liveweight gain had

reduced the difference in liveweight of 43 kg, established between the L_{40} and H cows by 40 days post-calving, by 72% to a small 12 kg.

The most important effect of the L_{40} treatment was to prolong the time to first service of these cows from 19 to 26 days ($P < 0.05$). There was a difference of 23 kg in the mating weights of the two groups. The difference in mating dates was reflected in a ten-day longer calving interval for the L_{40} cows.

Trials II and III were essentially replicates of the same trial design and, although pre-calving liveweights of the cows were slightly higher (20 kg) in Trial III, the loss in weight from calving to 22 days post-calving was slightly more severe, so that the average weight at 22 days for both Trials II and III were very similar. Despite the slightly slower recovery in weight after 22 days in Trial III, an analysis of the results of the two years revealed no significant differences between years except in the performance of the calves, and, consequently, the cow performance has been combined for the two years. The effect of the L_{22} treatment was a loss of 1.20 kg/head/day compared with a gain of 0.80 kg/day for H cows which resulted in a 42 kg difference in liveweight of the two groups of cows at 22 days. This difference had been reduced to 20 kg by mating and still further reduced by mid-January.

A significant reduction in 24-hour SCM yield ($P < 0.05$) in the first milk test, which was 17 days post-calving, was observed in the L_{22} cows but this did not have any real effect on calf performance at 22 days or at any later date.

In Trial II a small but non-significant increase of three days in the subsequent calving interval of the L_{22} cows (361 *vs* 358) was observed. Some difficulty with the bull harness in Trial II prevented reliable data for service dates being presented. Similarly, data on the calving interval resulting from Trial III will not be available until August/September 1977.

Using the data from Trials I and II only, no significant correlation could be established between total lactation SCM and calving interval and there was only a small positive correlation ($P > 0.05$) between date of calving in the year of the trial and the following year.

DISCUSSION

The results of these trials taken together show that it is unlikely that a low level of nutrition (liveweight loss) for 22 days after calving in mixed-age beef cows will have important effects

TABLE 2: PERFORMANCE OF BEEF COWS SUBJECTED TO A HIGH OR LOW PLANE OF NUTRITION POST-CALVING

	Cow Performance									*Calf Performance*		
		Liveweight (kg)			*SCM Milk Yield*[3]		*Total SCM*	*Days to*	*Calving*	*Liveweight (kg)*		
Treatment	*Pre-calving*	*Change*[1]	*Mating*	*Weaning*[2]	*1st*	*2nd*	*Lactation*[2]	*1st Service*[4]	*Interval*	*Birth*	*Change*[1]	*Weaning*[2]
I H	368	365	386	438	8.26	8.03	1013	19.1	357 (10)	26.7	60.0	152
I L_{40}	364	328	363	426	6.95	6.99	873	25.7* (12)	367 (8)	27.0	54.6	148
II H	449	435	469	528	9.03	10.2	1683		358 (11)	31.2	49.6	150
II L_{22}	457	402	449	513	8.56	9.08	1518		361 (12)	30.7	49.2	143
III H	490	443	447	553	10.6	10.3	1461	15.9 (10)		33.3	49.4	162
III L_{22}	464	391	426	531	8.35	10.2	1498	16.4 (11)		32.6	55.9	164
II	453	419	459	520	8.80	9.87	1600			31.0	49.4	147
III	477	417	436	542	9.48	10.3	1479			33.0*	55.2*	163*
H	470	439	458	540	9.82	10.24	1572			32.2	52.8	156
L_{22}	460	397***	438	522	8.45*	9.90	1508			31.7	51.8	154

(1) Liveweight at 40 days post-calving for Trial 1, 22 days post-calving for II and III.
(2) Lactation length and weaning age = 135 days in Trial I, 180 and 150 for II and III, respectively.
(3) First Test — 17 days post-calving, second test — 40 days post-calving.
(4) Figures in parentheses = No. of observations when less than total group.

on cow productivity. If, however, the period of poor nutrition is extended to 40 days, certainly with younger cows, this nutritional stress is beginning to affect their reproductive performance by extending the calving interval to over 365 days. It is important to note that post-calving return to oestrus is a more sensitive monitor of the adequacy or otherwise of post-calving nutritional regimes than the performance of the calves.

It should be pointed out that the recovery in liveweight after calving and the mating liveweights achieved in the L_{22} groups are substantially above those reported by Hight (1968a) for mixed-aged beef cows in a North Island hill country environment and are similar to those given by Scales and Stevenson (1976) for a high plane of nutrition post-calving.

The herd of cows involved in this work is essentially a lowland herd in which the cows lose weight during mid-pregnancy as a result of being fed a sole diet of barley straw but which can be fed well on pasture during spring as shown by the cow and calf body weights at weaning.

While the L_{22} cows had a significantly lower measured milk production at the first milking, this did not have a detectable effect on calf growth performance nor did it have a consistent effect on subsequent milk yield. This apparent anomaly is probably an artifact of the oxytocin technique. The technique measures potential milk production quite effectively but calves may not consume the milk available in early lactation. Geenty (1975) obtained similar results. Although H cows were producing more milk in the first 22 days of lactation, this was probably not being consumed. When the nutritional limitation was removed as early as 22 days after calving, the L_{22} cows were apparently as able as the H cows to produce more milk in response to the increasing energy demands of their calves. When the low plane continued for 40 days as in Trial I, there was a more permanent effect on cow milk production, resulting in a 14% reduction in 135-day SCM yield. The effects of these nutritional treatments on milk production estimates are in agreement with results from dairy cows (Broster *et al.*, 1969) showing increased milk production in response to additional feed being greater in early lactation. However, the fact that the level of nutrition for the first 22 days post-calving did not significantly influence total milk yield is somewhat in contrast to the dairy situation where the initial post-calving period is important in establishing a high peak milk production and total yield. This apparent conflict may be explained by the observation that calves are unlikely to be consum-

ing all the milk produced in the first three weeks. If the milk is not completely removed, its production is unlikely to improve overall lactation performance. Calves were apparently able to partially compensate for this lower milk production by increasing their grazing time from an average of 134 min. for H calves to 173 min. (Nicol and Sharafeldin, 1975). This may be the explanation for the small and non-significant difference in weaning weight of the L_{40} calves.

L_{40} cows grazed for an additional 50 min. per day or for 25% longer than H cows on the low plane of nutrition but no difference in the grazing time was observed after the 40-day changeover.

CONCLUSIONS

The results of this series of small trials suggest that no substantial harm is caused to the performance of a beef breeding cow by restricting her level of nutrition for a period of 22 days postcalving. However, care must be taken in extrapolating these results directly to beef breeding cows in more typical hill country conditions.

If the decision has to be made whether to allocate a scarce feed resource to the three weeks before, or to the post-calving period, then the former would take preference because of its beneficial effect on calf survival (Hight, 1966, 1968a, b). However, prolonged and rather more severe undernutrition postcalving has in other work shown very deleterious effects in both cow and calf performance.

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