

Protein nutrition of underfed beef cows suckling two calves

J.H. Topps

School of Agriculture, University of Aberdeen, Scotland, UK

Protein nutrition of underfed beef cows suckling two calves was studied during early lactation using Hereford × British Friesian cows. Feeding the cows with white fish-meal in each of the three years produced calves with a high growth rate (0,97 kg/day). The use of either groundnut meal or soyabean meal gave a response which was less than that obtained with fish-meal. It would seem that the more undegradable the protein source, the greater is the response in calf growth rate. The change in weight loss altered and could be related to a change in the nature of weight loss, from mainly fat tissue to less protein and water.

Proteïenvoeding van ondervoede vleisbees koeie wat twee kalwers laat suip is ondersoek gedurende vroeë laktasie deur gebruik te maak van Hereford × Britse Frieskoeie. Die voer van die koeie net uit vismeel in elk van die drie jare het kalwers geproduseer met 'n hoë groeitempo (0,97 kg/dag). Die gebruik van grondboontjiemeel of sojaboontjiemeel het 'n kleiner respons as dié met vismeel tot gevolg gehad. Skynbaar is die respons in kalf groeitempo groter, hoe moeiliker afbreekbaar die proteïenbron is. Die verandering in gewigsverlies het verander en kon in verband gebring word met die verandering in die aard van die gewigsverlies, van hoofsaaklik vetweefsel na minder proteïen en water.

Keywords: Underfed beef cows, two calves, undegradable protein.

Introduction

It is known that autumn-calving cows, which are in good condition at parturition as a result of grazing good quality summer pastures, are able to use body reserves to partly sustain the secretion of adequate milk for the growth of one or two calves (Topps, Paterson & Munthali, 1979). Many Hereford × Friesian crossbred cows, even when underfed, can produce sufficient milk to rear two calves, but their growth rate is usually less than that of single calves (Ross, Topps & Paterson, 1981). This project was designed to examine whether changing the protein nutrition of the cow by providing more undegradable protein would improve

the growth rate of double-suckled calves by stimulating milk secretion.

Materials and Methods

Animals

Eighteen Hereford × British Friesian cows were used in the first year and twelve in each of two successive years for a period of 20 weeks from the twenty-second day of lactation. The average weight of the cows after calving was 580 kg and they were in their second, third, fourth or fifth lactation. A third of the cows in the first year suckled their own calf only, but all the other cows had an additional foster calf obtained from a Friesian dairy herd.

Diets

The cows received a diet of grass silage, swedes, barley and barley straw which provided, daily, 84 and 102 MJ of metabolizable energy and 750 and 1120 g crude protein for the single- and double-suckled cows, respectively. All the feeds contained readily degradable proteins and the estimated degradability of the dietary protein was 0,80. The single-suckled calves received good quality hay only as a supplementary feed but all the double-suckled calves received the same hay and a concentrate mixture of barley, oats, soyabean meal, sugar-beet pulp and molassine meal in the ratio 8:6:3:2:1.

Experimental design and trial procedure

The cows were grouped in trios or pairs according to the date of calving and allocated, at random, to one of the following treatments. In the first year, a single calf, two calves, or two calves plus 1 kg/day white fish-meal; in the second and third year all the cows had two calves and the treatments differed only in the amount and source of additional protein. In the second year 1,0 kg white fish-meal was compared with 1,5 kg groundnut meal and in the third year the same amount of white fish-meal was compared with 1,4 kg soyabean meal. In all three years, the protein supplement replaced an equivalent amount of barley in terms of energy provided. Cows and calves were weighed regularly, milk consumption of the calves was estimated by weighing before and after suckling, and blood samples were taken to assess the nutritional status of all the animals.

Results

The mean growth rates of the calves for the three years are given in Table 1. Data for year one support earlier findings which showed that double-suckled calves, even if they are provided with a palatable concentrate, have a lower growth rate than single-suckled calves. The growth of the former has been found to be considerably less than that of the latter in the first 8 to 10 weeks of life when the calves eat very little hay or concentrate. However, in the first year, providing the cows with white fish-meal resulted in a high growth rate of double-suckled calves. A similar effect was obtained in the two successive years, but in the second year the feeding of groundnut meal gave significantly lower growth rates ($P < 0,05$) than those arising from the feeding of fish-meal, and a similar, but smaller non-significant difference was obtained with the feeding of fish-meal and soyabean meal in the third year.

Table 1 Mean growth rate (kg/day) of calves either single- or double-suckled by Hereford × British Friesian cows. Single-suckled calves received hay only, double-suckled calves hay and concentrate. Double-suckled cows received no or some additional protein from different sources

	Additional protein to the cow		Mean growth rate		
	Source	Amount (kg)	1979/80	1980/81	1981/82
Single-suckled	Nil		0,94	—	—
Double-suckled	Nil		0,83	—	—
Double-suckled	WFM	1,0	0,97	0,92	1,01
Double-suckled	GNM	1,5	—	0,83	—
Double-suckled	SBM	1,4	—	—	0,94

WFM = white fish-meal, GNM = groundnut meal, SBM = soyabean meal

The mean milk consumption of the calves for the three years is shown in Table 2. Differences between double-suckled calves in the different groups were small and not significant. However, the technique used to measure milk consumption has a limited precision and the inherent error is relatively larger with smaller consumptions.

Table 2 Milk consumption (kg/day) of calves either single- or double-suckled by Hereford × British Friesian cows. Single-suckled calves received hay only, double-suckled calves hay and concentrate. Double-suckled cows received no or some additional protein from different sources

	Additional protein to the cow		Milk consumption		
	Source	Amount (kg)	1979/80	1980/81	1981/82
Single-suckled	Nil		9,4	—	—
Double-suckled	Nil		6,6	—	—
Double-suckled	WFM	1,0	7,1	6,7	7,9
Double-suckled	GNM	1,5	—	6,6	—
Double-suckled	SBM	1,4	—	—	6,7

WFM = white fish-meal, GNM = groundnut meal, SBM = soyabean meal

The mean weight changes of the cows for the three years are shown in Table 3. The provision of a protein supplement to the cows resulted in a smaller weight loss even though their energy intake remained virtually the same. The nature of the protein supplement appeared to affect the magnitude of this reduction in weight loss.

Changes in the concentrations of certain blood characteristics, which are not given, indicated that the protein status of both the cows and the calves was improved when the cows received additional protein.

Discussion

The work of Gonzalez, Robinson, McHattie and Fraser

Table 3 Weight change (kg/day) of Hereford × British Friesian cows suckling either one or two calves. Single-suckled calves received hay only, double-suckled calves hay and concentrate. Double-suckled cows received no or some additional protein from different sources

	Additional protein to the cow		Weight change		
	Source	Amount (kg)	1979/80	1980/81	1981/82
Single-suckled	Nil		-0,39	-	-
Double-suckled	Nil		-0,50	-	-
Double-suckled	WFM	1,0	-0,21	+0,10	-0,25
Double-suckled	GNM	1,5	-	-0,40	-
Double-suckled	SBM	1,4	-	-	-0,20

WFM = white fish-meal, GNM = groundnut meal, SBM = soyabean meal

(1982) with ewes in negative energy balance in early lactation and each suckling two lambs showed that milk yields and the content of milk proteins were increased when a number of protein concentrates were added to a basal diet which contained 94 g crude protein and 10 MJ of metabolizable energy per kg dry matter. Of the six protein concentrates used, white fish-meal and blood meal, which have the lowest rumen degradability, gave the largest responses in both yield and composition. The results of the work reported here indicate that underfed Hereford × British Friesian cows suckling two calves may respond in a similar way to protein supplementation. The feeding of white fish-meal to the cows in each of the three years produced calves with high growth rates and in year one there was a marked difference in the growth rate of calves suckling cows that received no extra protein. The use of either groundnut meal or soya-

bean meal gave a response which was less than that obtained from white fish-meal, with the difference between groundnut meal and white fish-meal being significant. The degradability of groundnut meal is known to be higher than that of white fish-meal with that of soyabean meal probably being intermediate. It would seem that the more undegradable the protein the greater the response in calf growth rate, which is similar to the effect found by Gonzalez *et al.* (1982) in ewes. The change in the weight loss is interesting and it suggests that the nature of weight loss is altered to mainly fat tissue and less protein and water. The greater energy concentration of fat compared with that of protein + water (lean tissue) would result in less weight loss even if the same or more body energy was being used. The nature of the weight lost by beef cows has been shown to vary considerably (Trigg & Topps, 1981).

The beef cow in raising one calf per year is a biologically inefficient animal compared with dairy cows and certain other livestock. Breeds which have sufficient 'dairy' characteristics are likely to have the ability to raise two calves. Such a practice may become more widespread now that some success has been achieved in inducing twins under field conditions.

References

- GONZALEZ, J.S., ROBINSON, J.J., McHATTIE, I. & FRASER, C., 1982. The effect in ewes of source and level of dietary protein on milk yield, and the relationship between the intestinal supply of non-ammonia nitrogen and the production of milk protein. *Anim. Prod.* 34, 31–40.
- ROSS, Alison, C., TOPPS, J.H. & PATERSON, G.F.M., 1981. Response of underfed beef cows suckling two calves to an undegradable source of protein. *Anim. Prod.* 32, 387.
- TOPPS, J.H., PATERSON, G.F.M. & MUNTALI, 1979. Performance and nutrition of calves which are double-suckled. *Anim. Prod.* 28, 421.
- TRIGG, T.E. & TOPPS, J.H., 1981. Composition of body-weight change during lactation in Hereford × British Friesian cows. *J. Agric. Sci. Camb.* 97, 147–157.