

Drying-off thinner cows earlier in late lactation – is it beneficial?

J. D. MORTON¹ and S.D. McBRIDE²

¹AgResearch, Invermay Agricultural Centre, PB 50034, Mosgiel

²Fonterra, P.O. Box 284, Ashburton

jeff.morton@agresearch.co.nz

Abstract

In New Zealand dairy systems, cows usually lose condition in early lactation, when their feed demand is high, to buffer milk solids (MS) production. Condition score (CS) at calving is influenced by drying-off date and CS at drying-off. In late-March, two groups of cows with average CS 4.5 were dried off early and offered normal (13 kg DM/cow/day) and high (26 kg DM/cow/day) pasture feeding allowances. Another group of average CS 4.5 was offered 26 kg DM/cow/day and dried-off late (mid-May). Two more groups with average CS 5.1 were offered normal (26 kg DM/cow/day) and high (52 kg DM/cow/day) allowances and also dried-off late. From late-March to mid-May, dry cows fed at the high level gained about twice as much condition as normally fed dry cows (+1.5 vs +0.7 CS). The late dried-off cows at initial CS 4.5 and 5.1 had a gain in CS (0.3 units) or maintained condition respectively under normal feeding, but gained 0.4 CS under high feeding. In late lactation, there was no significant difference in MS production ($P < 0.05$) from high compared to normal feeding at CS 5.1, but the high fed cows produced significantly more MS than the normally fed cows at CS 4.5. In the next lactation, from calving in late-August to late-October, there was a trend for both early and late dried-off cows that had been fed at a high level in the preceding late lactation to produce more MS than those that had been normally fed (1.93 vs 1.79 kg MS/cow/day averaged across both CS groups). Drying-off date had a significant effect on MS production in early lactation (early drying-off 1.93 kg MS/cow/day vs late drying-off 1.76 kg MS/cow/day) for cows with initial CS 4.5. There was a strong relationship between CS at calving and MS production in early lactation, with 1 extra CS at calving equivalent to 0.19 kg of extra MS/day. Changes in cow body fat content during late lactation corresponded closely to changes in CS (52 kg body fat/CS unit). The results suggest that where autumn feed is limited, there is little difference in the efficiency of pasture use between normal autumn feeding of late dried-off fatter cows to allow higher autumn feeding of early dried-off thinner cows (5.0 kg MS/kg DM), compared with normal autumn feeding of early dried-off thinner cows to allow higher autumn feeding of late dried-off fatter cows (4.7 kg MS/kg DM).

Keywords: cow body fat content, cow condition score, dairy cows, drying-off date, feeding level, milk solids production

Introduction

In a commercial New Zealand dairy herd, where cows are adequately fed for the whole year, peak condition normally occurs at calving, with condition loss during early lactation because cows are in energy deficit. An important attribute of the high producing dairy cow, particularly in early lactation, is its ability to draw on body reserves to support milk production when the intake of nutrients is insufficient to meet requirements (Wilson *et al.* 1988). It is possible for cows to recover condition in late lactation if feed supply is greater than required for milk production or if thin cows are dried-off before the normal end of lactation in mid- to late-May. Cows in fatter condition at calving have been reported to produce at a higher level than those which are thinner (e.g. Morton & Jensen 1990), due to a greater contribution of body tissue reserves to milk production.

The management factors that contribute to the decision about when to dry-off the herd in late lactation are cow condition score (CS), daily milk solids (MS) production, farm pasture cover and availability and cost of winter feed. Cows will gain condition at a greater rate when dry rather than lactating and early drying-off of thin cows can be justified more easily when the cost of autumn grown pasture is less than that of winter supplement or off-farm winter grazing. The decision on when to dry-off thinner cows depends on the extra MS produced from having cows in better condition at calving compared with the MS production foregone in late lactation, plus the efficiency of pasture use when fed to early or late dried-off cows. The trial results reported in this paper provide information that will assist in making drying-off decisions.

Materials and methods

Site

The trial was carried out on several paddocks on a commercial dairy farm (late and early lactation) and Winchmore Irrigation Research Centre (winter) near Ashburton. Pasture in the trial paddocks had a high content of ryegrass and white clover (60-80%) mainly in the vegetative state.

Table 1 Drying-off date, initial CS and autumn feeding level for each treatment.

Drying-off date	Initial CS	Description	Autumn feeding level (March – May)	
			Pasture allowance (kg DM/cow/day)	Pasture disappearance (kg DM/cow/day)
Early – 29 Mar	4.5	Normal	13	10.5
Early – 29 Mar	4.5	High	26	15.4
Late – 20 May	4.5	Normal	26	13.7
Late – 20 May	5.1	Normal	26	13.7
Late – 20 May	5.1	High	52	18.1

Design and treatments

Autumn

In early-March 1991, 90 two to five year Friesan/Jersey cross cows which were due to calve in the first ten days from the planned start of calving in the next lactation were selected from a herd of 850 cows. Thirty of the 90 cows selected were to be culled because they had not conceived at the preceding mating. Ten of the cull cows, representative of the average age and live weight of the whole group were chosen for slaughter on 9 March. The remaining 20 cull cows were allocated in equal numbers to each of the 5 autumn management treatment groups according to age, breeding index (mean 130), live weight and CS, and slaughtered on 21 May.

The five autumn management treatment groups, each of which had 16 cows (including the 4 cows to be culled) allocated on 8 March, are shown in Table 1. For the groups with initial CS 4.5, individual cow CS ranged from 3.5 to 4.75 and for the groups with initial CS 5.1, cow CS ranged from 4.0 to 6.0. Initial mean live weights were 424 kg for the lower CS and 450 kg for the higher CS groups. Normal autumn feeding was intended to increase CS to about 5.0 for the early dried-off group and maintain CS for the late dried-off groups. High autumn feeding was designed to increase CS for the early dried-off group to about 6.0 and for the late dried-off group by up to 0.5 CS. The cows were grazed in four separate groups with the late drying-off, normally fed cows at initial CS 4.5 and 5.1 combined into one group.

Winter and early spring

All of the trial cows were managed as part of one larger group during winter and fed pasture to maintain condition

between mid-May and calving. Once calved from mid- to late-August, the cows were grazed as one group until late-October and fed adequate pasture to produce 1.75 – 2.0 kg MS/cow/day.

Measurements

Herbage mass pre- and post-grazing was determined by cutting pasture quadrats to ground level before and after grazing and measuring the dry matter (DM) content, each week during autumn. Daily pasture allowance and pasture disappearance were calculated from pre-grazing herbage mass and the difference between pre- and post-grazing herbage mass respectively. Condition score of each cow was visually assessed on 8 March (initial), 22 March (start of early drying-off), 20 May (late drying-off), 5 August (pre-calving) and 30 October. The slaughtered cows were dissected into body parts including the gut, and the fat content of each part was measured chemically (ether extract) from ground samples. Daily milk production from each cow was measured twice weekly from 8 to 29 March (all five groups), 29 March to 20 May (three late drying-off groups) and 22 August to 30 October (all groups) and fat and protein content determined to derive MS production. Analysis of variance using GENSTAT was carried out on individual cow CS, MS production and body fat content to detect statistically significant differences between the means for treatment groups of cows.

Results

Change in cow condition

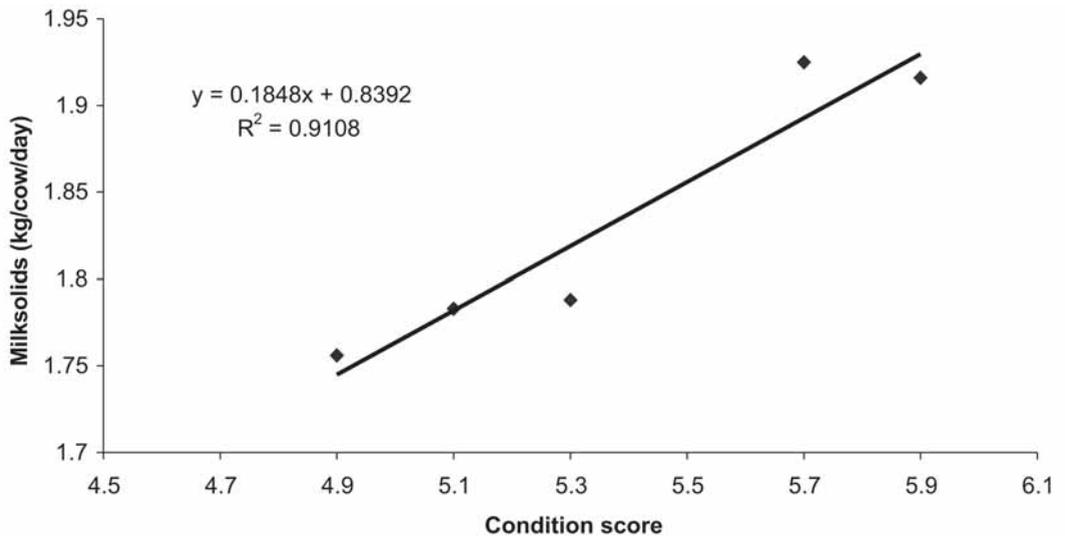
Early drying-off resulted in a significantly greater increase in CS during autumn ($P < 0.05$) than late drying-off (Table 2). Increasing autumn feeding level from normal to high

Table 2 Effect of drying-off date and autumn feeding level on change in cow CS.

Drying-off	Treatment Feeding	Initial CS	Change in CS		
			March-May	May-August	August-October
Early	Normal	4.5	+0.7	-0.1	-0.7
Early	High	4.5	+1.5	-0.3	-1.1
Late	Normal	4.5	+0.3	+0.1	-0.3
Late	Normal	5.1	0.0	+0.2	-0.5
Late	High	5.1	+0.4	+0.4	-0.8
LSD ($P < 0.05$)			0.23	0.28	0.28

Table 3 Effect of drying-off date and autumn feeding level on MS production (kg/cow/day) in March, April-May and September-October.

Treatment		Initial CS	MS production		
Drying-off	Feeding		March	April - May	August-October
Early	Normal	4.5	0.97		1.78
Early	High	4.5	1.15		1.93
Late	Normal	4.5	1.01	0.94	1.76
Late	Normal	5.1	1.05	1.04	1.79
Late	High	5.1	1.12	1.14	1.92
LSD (P<0.05)			0.159	0.188	0.167

Figure 1 Relationship between CS at calving and MS production in early lactation (mean of each treatment group).

for both early and late drying-off groups significantly increased CS during autumn. Over winter, there was a significantly greater increase in CS from the cows that were dried-off late and had higher initial CS than the cows that were dried-off early. In early lactation, cows that had been dried-off early, and cows that had been dried-off late and fed at a high level in autumn, and hence were in better condition at calving, lost significantly more condition than cows that had been dried-off late and normally fed. For both drying-off dates, high autumn

fed cows lost significantly more condition in early lactation than normal autumn fed cows.

Milk solids production

In March, the high fed cows produced significantly more MS ($P < 0.05$) than the normally fed cows, but only for the group with lower initial CS (Table 3). The high fed cows at initial CS 5.1 produced significantly more MS than the normally fed cows at CS 4.5 in April-May. There was greater MS production in early lactation from

Table 4 Effect of drying-off date and autumn feeding on change in cow body fat content (kg) and CS.

Treatment		Initial body fat	Change in body fat	Change in CS during autumn
Drying-off	Feeding			
Early	Normal	73.0	+34.6	+0.7
Early	High	73.0	+62.6	+1.5
Late	Normal	73.0	+14.9	0.3
Late	Normal	98.0	+4.9	0.0
Late	High	98.0	+27.4	+0.3
LSD (P<0.05)			9.13	0.23

cows at a high compared with a normal autumn feeding level, for both drying-off dates, with the differences just failing to achieve significance at the 5% level of probability. There was a significant increase in MS production in early lactation from cows at initial CS 4.5 dried-off early, compared with cows dried-off late, with both groups offered the same autumn pasture allowance (26 kg DM/cow/day).

Condition score at calving and milksolids production

There was a strong linear relationship between mean CS at calving and MS production in early lactation (Figure 1). An average increase from CS 5 to 6 at calving resulted in an extra 0.19 kg MS/cow/day in early lactation.

Change in cow body fat content

For each drying-off date, there was a significantly greater increase ($P < 0.05$) in body fat content from high compared with normal feeding (Table 4). Early compared with late drying-off for cows at initial CS 4.5 that were offered the same allowance, significantly increased cow body fat content during autumn ($P < 0.05$). There was also a significantly greater increase in body fat content from the late dried-off group at initial CS 4.5 compared with 5.1. On average, a gain of 1 CS unit was associated with an increase of 52 kg of cow body fat.

Discussion

Although there have been past studies of the effect of pasture feeding in either early (Grainger *et al.* 1982) or late (Holmes *et al.* 2002) lactation on cow condition and MS production, none have investigated the effect of feeding in late lactation on MS production in the early part of the following lactation. In the last 30 days of lactation, dry cows of initial CS 4.5 with pasture intakes of 12 kg DM/cow/day, intermediate between our normal and high feeding treatments, gained 1 CS unit (Holmes *et al.* 2002) which was a greater daily rate of gain than our average of 1.1 CS over 45 days. The difference could have been caused by higher feed quality in the trial reported by Holmes *et al.* (2002). For lactating cows with pasture intakes of 12 kg DM/cow/day, similar to our normal feeding level, Holmes *et al.* (2002) reported a gain of 0.1 CS over 30 days which was similar to the maintenance of condition from our cows. MS production was lower at 0.87 kg/cow/day in the Holmes *et al.* (2002) trial than in our reported trial (1.05 kg/cow/day) but in the reported trial, cows were initially CS 5.0 compared with CS 4.5 for Holmes *et al.* (2002). Grainger *et al.* (1982) reported an increase of 0.15 kg MS/CS unit at calving in the first 5 weeks of lactation compared with our 0.19 kg MS/CS unit in the first 10 weeks of lactation. In addition to the shorter measurement period, their comparison was between CS

4.0 and 5.0 at calving whereas ours was between CS 4.9 and 5.9 so this could possibly help explain the difference. During the same period, for a similar range in CS to our reported results, Morton & Jensen (1990) measured 0.20 kg MS/CS unit at calving.

It is apparent that the reported data are generally similar to other published data. The effect of early drying-off on MS production in late lactation and the following early lactation can now be examined. This will be carried out on a gross MS production basis or in terms of efficiency of pasture use.

If the two groups of cows with initial CS 4.5 and an autumn pasture allowance of 26 kg DM/cow/day are compared, the cows dried-off early lost the opportunity to produce 56 kg MS during late lactation for a gain of only 12 kg MS/cow in the first 10 weeks of the next lactation. In late-October, both groups had an average CS of 4.6. Since pasture disappearance for both groups of cows was similar during autumn, there would have also been little difference in pasture cover in mid-May. Therefore if cows are in CS 4.5, producing about 1 kg MS/cow/day and can be offered 26 kg DM/cow/day to maintain cow condition without compromising winter feed supply, then early drying-off will result in a loss in total MS production in late lactation and the following early lactation. This situation would be relevant to a dairy farm where autumn pasture growth is not limited (e.g. with unrestricted irrigation) and/or where cows are wintered-off.

When the total MS production in late and early lactation in relation to pasture disappearance (assumed to be intake) is considered, a different outcome occurs. In terms of kg MS/kg DM, high autumn feeding of early dried-off thinner cows was most efficient at 6.0, followed by high feeding of late dried-off fatter cows at 4.9, and normal feeding of early dried-off thinner cows, late dried-off thinner cows and late dried-off fatter cows at 4.4, 4.2 and 4.0 respectively. High autumn feeding of early dried-off thinner cows combined with normal feeding of late dried-off fatter cows resulted in a slightly higher efficiency of pasture use than normal feeding of early dried-off thinner cows and high feeding of late dried-off fatter cows (5.0 cf. 4.7). Analysis based on efficiency of feed use is more appropriate where autumn pasture growth is restricted by low rainfall and temperatures and/or the herd is wintered on-farm. If pasture cover is low in late lactation and there is a risk of loss of cow condition, other options would include once-a-day milking or feeding high quality supplements.

The trial results also indicated that if cows are offered very high pasture allowances in late lactation they will gain condition at the expense of increased MS production. Holmes *et al.* (2002) measured only 50% of the marginal

efficiency of MS production from pasture in late compared with early lactation.

Although there was a reasonably close relationship between change in CS and cow body fat content between treatment groups as also reported by Wright & Russell (1984) for beef cows, it is difficult to define an absolute value for kg body fat/CS unit because of the variability of assessing CS with different operators and between strains of cow. Nevertheless Wright & Russell (1984) reported 42 kg of body fat associated with 1 CS unit (adjusted to match the New Zealand CS scale) from British Friesian cows which was in reasonable agreement with the 52 kg body fat/CS unit measured in our New Zealand Friesian/Jersey cows. In this trial, 1 CS unit was equivalent to 65 kg live weight (results not shown), which indicated that most of the change in cow condition represented change in body fat.

Conclusions

Dairy cows will gain condition faster in late lactation from the same pasture allowance if dry compared with still lactating. If cows are offered high pasture allowances in late lactation they will build up condition rather than produce more milk. Cows in better condition at calving used their greater body fat reserves, accumulated from earlier drying-off in the previous latter part of lactation, to produce more MS than cows in poorer condition. There was little difference in efficiency of pasture use from feeding late dried-off fatter cows less while still lactating in order to feed early dried-off thinner cows better, compared with restricting pasture to early dried-off thinner cows to better feed fatter late dried-off cows.

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