Pasture allowance, duration and lactation stage: effects on early lactation production

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Abstract

Spring grass availability can be a big challenge for Irish dairy farms due to limited over winter growth. The objective of this experiment was to determine the effect of pasture allowance (PA) offered for varying durations in early lactation on cumulative milk (MY) and milk solids yield (MSY), bodyweight and body condition score. Intake capacity (IC) was calculated for the control group (C) and they were offered a 100% PA. The remaining treatments were offered 60% PA for either two (×2) or six weeks (×6) from week one (E), three (M) and five (L) of experiment. All cows received 100% IC from week 11. After 10-weeks C had a greater MY than all treatments (+ 151 kg cow^{-1}). The E60 × 2 and L60 × 2 treatments had similar 10-week MSY to C (121 kg cow^{-1}), and C was higher than all other treatments (+ 11 kg cow^{-1}). Cumulative production at 33-weeks was higher for the C and E60 × 2 compared to L60 × 6. Despite immediate effects on milk production during periods of low grass availability, PA can be reduced with minimal effect on total lactation production with the exception of an extended restriction at peak milk production. However, other aspects of production need to be considered.

Keywords: pasture allowance, early lactation, dairy production

Introduction

Pasture availability in early spring can be highly variable, due to prevailing climatic conditions with many farmers experiencing short term deficits throughout the first and second grazing rotation. PastureBase Ireland data (Hanrahan *et al.,* 2017) has shown large variation in spring growth on farm, with year-to-year variation as high as 40%. Dry matter (DM) intake in early lactation is critical as cows reach peak milk production and peak DM intake; therefore, it is essential to determine the repercussions of restricting pasture during this period. Previous research has focused on supplementation strategies to overcome deficits in grass supply, however, supplementation can reduce grass utilisation (Kennedy *et al.*, 2007) and increase production cost. In recent years studies have shown that post-grazing sward height can be used as a short term tool to control pasture allowance (PA) in early lactation without impairing total lactation performance (Ganche *et al.*, 2013; Crosse *et al.*, 2015). However, PA was controlled for a period of ten weeks in these experiments with actual PA deficits unlikely to extend for this period in practical circumstances, therefore, the current experiment looked at the impact of shorter term reductions. The objective of this study was to determine the effect of reduced PA offered for varying durations at different stages in early lactation, on short term and total lactation production.

Materials and methods

The experiment was undertaken at Teagasc Moorepark, Animal and Grassland Research and Innovation Centre, Fermoy, Co. Cork, Ireland from 14 March to 31 October 2016. The experiment was a randomised block design that consisted of seven grazing treatments. A total of 105 cows (30 primiparous) were randomly assigned to each of the treatments (n = 15). Cows were balanced on breed, calving date, parity, days in milk (DIM), pre-experimental milk production, BW and BCS gathered during the two weeks prior to commencement of the experiment. The control group (C) were allocated a PA representing 100%

of their intake capacity (IC; Faverdin *et al*., 2011), which takes cognisance of parity, age, DIM, BW and BCS, diet characteristics and potential milk production amongst other factors. The remaining treatments were allocated 60% of the PA offered to the C treatment for a period of either two (×2) or six weeks (×6) from week one (E), three (M) or five (L) of the experiment. Once their respective 60% PA durations had finished, all treatments received 100% of IC. From week 11 all cows grazed as a single herd. All PA were offered above 3.5 cm; post grazing sward height was not restricted. While treatments were imposed, herds grazed separately but adjacent to one another, separated by temporary electric fences. All cows received a fresh PA after each milking until all treatments had ceased in week 11. Herbage mass (HM; > 3.5 cm) was measured twice weekly by cutting eight 10 m strips from the grazing area. Pre- and post-grazing sward height was measured on a daily basis using a rising plate meter (Jenquip Rising Plate Meter, New Zealand). Milk yield (MY) was recorded on a daily basis. Milk composition was determined weekly from one successive evening and morning milking. Fat and protein concentrations were measured using MilkoScan 203 (DK-3400, Foss Electric, Hillerød, Denmark). Bodyweight and BCS (1 to 5 scale: 1 = emaciated, 5 = extremely fat) in increments of 0.25; (Lowman *et al*., 1976) were also measured by a trained independent observer on a weekly basis. Milk and milk solids yield (MSY) were summed following the first ten weeks of the experiment and also at the end of the experiment (week 33). Bodyweight and BCS at the end of each period were also analysed. Variables associated with production were analysed using PROC MIXED models in SAS version 9.4 (SAS Institute Inc., Cary, NC, USA). The models contained terms for treatment, breed, parity, DIM and pre-experimental production covariates. These covariates were centred within breed and parity.

Results and discussion

After ten weeks on experiment, C had significantly higher cumulative MY than all other treatments (+ 151 kg milk cow^{-1}). The E60 × 2 and M60 × 2 had similar production to E60 × 6 and M60 × 6 and L60 × 2. However, L60 × 2 produced more milk than L60 × 6 (+ 82 kg milk cow^{-1}). The L cows were at peak milk production (59 DIM, ± 11 days) at the onset of their 60% PA treatment and this may have had a greater negative impact on subsequent milk production when compared to PA reductions imposed at other stages of early lactation. The E60 × 2 and L60 × 2 treatments had similar MSY to C (121 kg MS cow^{-1}) over the ten weeks, however, the M60 × 2 treatment and all 60 × 6 PA treatments had significantly lower MSY than C (- 11 kg MS cow^{-1}; Table 1). There were similar numerical differences between all 60 × 2 treatments and their respective 60 × 6 treatments, which demonstrates that the six week reduction may have a more severe effect on MSY. Bodyweight and BCS were similar for all treatments at week ten (477 kg cow^{-1} and 2.83, respectively) and, therefore, further investigation is required regarding indicators of energy status throughout the ten weeks to determine the true effect of reduced PA on the cow. There was a tendency ($P = 0.079$) for C and E60 × 2 to have greater total MY than the L60 × 6 treatment (Figure 1). The greater loss in production observed by the L60 × 6 treatment group at ten weeks was reflected in total performance compared to C (- 416 kg cow^{-1}). There was no effect of treatment on the remaining variables analysed (323 kg MS cow^{-1}, 512 kg BW, 2.83 BCS).

Table 1. The effect of pasture allowance (60 and 100%) and duration (×2 and ×6 weeks) in early (E), mid (M) and late (L) early lactation on ten week cumulative production - milk yield (MY), milk solids yields (MSY), bodyweight (BW) and body condition score (BCS).[1]

Treatment	Control (100)	E60×2	E60×6	M60×2	M60×6	L60×2	L60×6	SE	*P*-value
MY (kg cow^{-1})	1,603^{a}	1,496^{b}	1,431^{bc}	1,468^{bc}	1,429^{bc}	1,487^{b}	1,405^{c}	22.7	0.001
MSY (kg)	124^{b}	118^{abc}	113^{ac}	114^{ac}	110^{c}	121^{ab}	116^{ac}	2.5	0.014
BW (kg)	487	476	456	488	481	472	482	15.3	0.816
BCS	2.76	2.78	2.83	2.79	2.88	2.85	2.89	0.036	0.076

[1] a-c - values not sharing common superscript are significantly different.

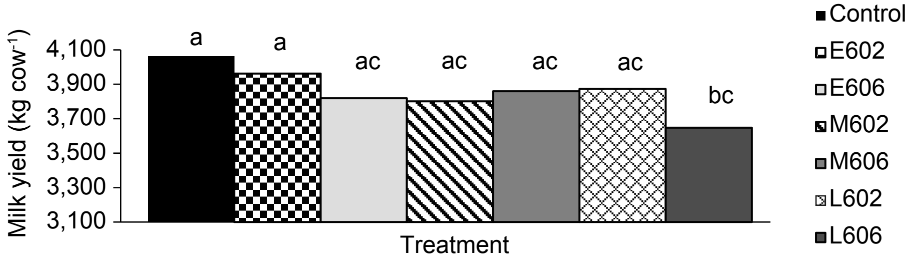

Figure 1. Total milk production for the 33-week experimental period.

Conclusions

While allocating a 60% PA can reduce MY and MSY in the short term, this study demonstrates that a greater reduction in total production occurs when PA is reduced at peak milk production. However, prior to this, reduced PA has minimal effect on total performance once PA is restored to 100% of IC. This suggests that reducing PA has the potential to become a tool to overcome short term grass deficits prior to cows reaching peak milk production. However, further investigation is required to determine the effects of such reductions on other factors influencing dairy cow production such as health, fertility and welfare.

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