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Sward characteristics, grass dry matter intake and milk production performance is affected by timing of spring grazing and subsequent stocking rate

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Abstract

The objective of this study is to investigate the effect of contrasting spring grazing dates (GD) and stocking rate (SR) on sward characteristics, grass dry matter intake and milk production performance of autumn calving dairy cows during the spring period. Two swards were created by grazing in March (early grazing; E) or by delaying first grazing until mid-April (late grazing; L). Two stocking rates, high (H; 5.5) and medium (M; 4.5) were applied across each sward. Forty eight autumn calving Holstein cows (160±35 days in milk) were assigned to one of four ($n=12$) different grazing treatments. The experiment began on April 17th and finished after 2 grazing rotations on June 20th. Later spring grazing significantly increased herbage mass (kg DM/ha) above ground level (+933, $P<0.05$) and >50 mm (+738, $P<0.05$). Compressed sward height (+22.1 mm, $P<0.05$), extended tiller height (+73 mm, $P<0.001$) and pseudostem height (+35 mm, $P<0.001$) were also significantly higher for later grazed swards. In the grazing horizon (>80 mm— extended tiller height), later grazed swards had significantly lower leaf proportion (−0.09, $P<0.05$) and higher dead material (+0.05, $P<0.001$). Daily herbage allowance (>50 mm) was on average 12.7, 15.9, 18.2 and 21.9 kg DM/cow for EH, EM, LH and LM, respectively. Daily leaf allowance (>80 mm) was 10.1, 12.3, 13.3 and 14.5 kg DM/cow for EH, EM, LH and LM, respectively. The EM (16.2 kg DM/cow), LH (+0.1 kg) and LM (0.8 kg) treatments all had similar grass DM intake, however there was evidence of an interaction ($P<0.10$) between GD and SR, this was due to the low grass DM intake of the EH (13.9 kg DM/cow) treatment. When expressed as UFL (Fill unit) intake the EM treatment recorded the highest value. There was a significant interaction between GD and SR ($P<0.01$) for milk, protein yield, 4% fat corrected milk yield ($P<0.05$) and protein concentration ($P<0.001$). Cows grazing the EM treatment produced 23.9 kg of milk, 876 and 685 g of fat and protein yield. The difference in milk production (cow/day) between EM and EH treatments was +3.6 kg milk, +98 g fat and +107 g protein. The production yield difference between LM and LH treatments was +1.1 kg milk, +27 g fat and +29 g protein in favour of the LM treatment (23.9 kg of milk, 877 and 687 g fat and protein yield). Herbage quality and morphological characteristics are clearly improved with early spring grazing as herbage mass is reduced on subsequent rotations. Swards grazed in early spring allow higher grass utilisation and high milk production performance when grazed at a medium stocking rate. Improved milk production from herbage can be achieved provided herbage mass and allowance are maintained at levels where herbage quality decreases are minimised.

Keywords: Dairy cows; Herbage intake; Spring grazing; Turnout date

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1. Introduction

Spring grazing is dictated by turnout date which varies widely from farm to farm but is dependant on soil conditions, available grazing area, autumn grazing management, spring grass growth and prevailing weather. Late turnout to pasture can lead to poor herbage utilisation for a variety of reasons, *i.e.* high pre-grazing herbage mass, poor herbage quality, too low grazing stocking rates or poor grass utilisation conditions. From a grazing management perspective early grazing leads to lower herbage mass and pre-grazing height in the following grazing rotations. A number of studies investigated the effects of early grazing on herbage mass production and sward dynamics (Carton et al., 1989a,b; Michell and Fulkerson, 1985). Both authors concluded that spring grazing improves sward quality. The effects of spring grazing on animal performance and grass dry matter intake (GDMI) and subsequent sward quality is relatively undocumented. Hoogendoorn et al. (1992) found that cows grazing ryegrass-white clover swards during the summer in New Zealand produced more milk, milk fat and milk protein on lower (2.5 t DM/ha) rather than medium (5.3 t DM/ha) mass swards at the same herbage allowance. If sward quality is improved by spring grazing, the benefits in improved sward quality should result in increased dairy cow performance and higher total energy intake.

High herbage allowance is required to achieve maximum intake and milk yield per cow (Delaby and Peyraud, 1998). Herbage allowance in strip-grazing systems and/or pre-grazing herbage mass, have marked effects on herbage intake (Wales et al., 1998, 1999). Curvilinear relationships exist between herbage allowance and intake for grazing dairy cows, with intake increasing with higher herbage allowance (Stakelum, 1986a,b; Holmes, 1987; Delagarde et al., 2001). Increased herbage allowance in the early season also increases residual sward height. This results in a deterioration of sward quality in mid- and late season. The level of pre-grazing herbage mass and the previous grazing management have large impacts on the sward nutritive value (Delagarde et al., 2001). Delaby and Peyraud (1998) and Hoden et al. (1991) found that herbage intake can be increased by 1 kg cow per day when increasing residual sward height by 1 cm in spring without negative effects upon sward quality later in the season. Stakelum and Dillon (1990), Hoogendoorn et al. (1992) have shown increases in the proportion of stem and dead material and reduced herbage digestibility following lax grazing in the early season.

The timing of spring grazing impacts on a number of grassland parameters such as subsequent grass production, utilisation and nutritive value and sward characteristics. The implication is that grazing systems designed to maximise individual animal performance are inefficient in utilisation per ha (MacCarthy, 1984). However, from a land use perspective increasing the number of grazing days at grass is recommended for all farmers. In a previous paper focussing on the animal performance and grazing management from the same experiment O'Donovan et al. (2004) found that earlier grazing has positive effects on milk production performance even at low daily herbage allowance. This paper examines the effect of contrasting spring grazing dates and stocking rate on sward characteristics, GDMI and its relationship with milk production performance of dairy cows. The hypothesis tested in this study was that swards grazed early in spring have beneficial effects on sward characteristics and herbage quality, GDMI and milk production of cows into the late spring/early summer period.

2. Materials and methods

2.1. Treatments and experimental design

Two swards with different spring grazing dates and two stocking rates were compared. Different swards were contrasted by either grazing in March (early grazing; E) or by delaying the start of grazing until mid-April (late grazing; L). Two stocking rates were imposed across each sward, High (H; 5.5 cows/ha) and Medium (M; 4.5 cows/ha).

The experiment took place over a 10 week period from April 17 to June 20 (2003) at the experimental farm of Mejusseaume (INRA, Le Rheu) located in the Rennes Basin in Brittany (France) using 48 cows and a total area of 12.1 ha.

2.2. Herbage and grazing management

Perennial ryegrass herbages, which were on average 5 years old (range 2–12 years) were used. The grass cultivar sown in the paddocks were all *Lolium perenne* cultivars been either; *cv.* Belfort, Hercules or Ohio. All cultivars were sown as monocultures. There was no clover in the swards.

Approximately half of the total land area was grazed off during March with lactating dairy cows. The cows grazed the early grazed paddocks to an average post-grazing rising plate meter height of 3.9 cm. The herbage height for ungrazed paddocks during this period was 7.9 cm. Grazing took place only when the animals were liable to cause the least amount of soil surface damage. During the pre-experimental grazing period the animals were housed by night. The sum of this grazing period