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Herbage intake and milk yield of dairy cows grazing perennial ryegrass swards or white clover/perennial ryegrass swards at low- and medium-herbage allowances

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Abstract

Including legumes in grass swards generally increases nutrient intake and performance of grazing cattle. The objective of this study was to determine if the difference in herbage intake of dairy cows grazing either perennial ryegrass swards (PRG) or white clover/perennial ryegrass swards (GC) is a function of herbage allowance. Both sward types were compared at 20 or 35 kg DM/cow/day offered at ground level according to a 4 × 4 Latin square design with four 10-day periods and with 24 Holstein cows in mid-lactation. Clover represented on average 270 g/kg of live DM material in GC swards. Pre-grazing herbage mass at ground level did not differ between sward types but pre-grazing herbage mass above 5 cm and sward height was much lower on GC than on PRG swards. There was no interaction between sward type and herbage allowance on herbage intake and milk yield. Cows grazing on GC swards had lower herbage intake (−0.7 kg OM/day), OM digestibility of the selected herbage (−20 g/kg OM) and milk yield (−1.3 kg/day) than cows grazing on PRG swards. Milk fat content was unaffected by sward type and milk protein content was lower on GC than on PRG swards. Herbage intake, herbage OM digestibility, milk yield and milk protein content increased, and milk

Abbreviations: A, herbage allowance; ADF, acid detergent fibre; CP, crude protein; DM, dry matter; DMI, dry matter intake; DOM, digestible organic matter; GC, perennial ryegrass/white clover sward; LW, live weight; N, nitrogen; NDF, neutral detergent fibre; OM, organic matter; PRG, perennial ryegrass sward; S, sward type

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fat content decreased, with increasing herbage allowance. It is concluded that including white clover in perennial ryegrass swards, along with suppressing nitrogen fertilisation, did not improve herbage intake or milk production when this is associated with a sharp decrease in sward height and herbage mass in the upper strata of the sward.

Keywords: Dairy cow; *Trifolium repens*; Herbage intake; Herbage allowance

1. Introduction

The replacement of N-fertilisation by addition of clover in grass-based swards has many advantages. In addition to reducing N-input costs and risks of N-leaching at the farm level, one agronomic advantage is a better distribution of annual herbage production (Frame and Newbould, 1986; Leach et al., 2000). For animal production, it has been shown that grazing ryegrass/clover swards could increase the milk production by 15–25% compared with perennial ryegrass swards (Phillips and James, 1998; Phillips et al., 2000). However, higher animal performance on mixed swards than on grass swards were mainly observed by reducing the stocking rate, because the primary productivity of mixed swards is 0.70–0.80 of that of pure grass swards with high N-fertiliser (Laidlaw and Teuber, 2001). In addition, the increase in milk production in mixed swards was shown to be more related to an increase in herbage intake than to an improvement of the nutritive value of the herbage (Harris et al., 1997, 1998; Ribeiro Filho et al., 2003).

Higher herbage intake on mixed swards than on grass swards can result from a higher voluntary intake of clover compared to pure grasses (Thomson, 1984; Institut National de la Recherche Agronomique, 1989), but also potentially from a better prehensibility of the defoliated strata (Rutter et al., 1998). For the grazing cow, mixed swards could be more prehensible than grass swards because the stolons of clover, contrary to the stem and pseudostem of grasses, remain very close to the ground, in the inaccessible and ungrazed layer (Frame and Newbould, 1986). This implies that the difference in herbage intake between mixed and grass swards is higher at low herbage allowance, because it is less difficult for cows to graze into the deep horizons of mixed swards.

The objective of this study was to determine if the replacement of N-fertilisation by introducing white clover into perennial ryegrass swards has similar nutritional advantages for strip-grazing dairy cows whatever the herbage allowance level.

2. Materials and methods

2.1. Treatments, experimental design and animals

The experiment was a 4×4 Latin square design with a 2×2 factorial arrangement of treatments, using two sward types and two herbage allowances. The sward types were either pure perennial ryegrass (*Lolium perenne*, PRG), or a mixture of perennial ryegrass and white clover (*Trifolium repens*, GC). Herbage allowances were 20 (low) and 35 (medium)