



## Effects of ensiled forage legumes on performance of store finishing lambs

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### Abstract

Male Beulah speckled face lambs (initial live weight (LW)  $28.8 \pm 0.31$  kg) were allocated to three dietary treatments to evaluate the performance of store lambs of a hill breed when offered ensiled lucerne (*Medicago sativa*), red clover (*Trifolium pratense*) or ryegrass. Second-cut silage bales (wilted and inoculated) were prepared from 3-year old lucerne and red clover stands and a 1-year old ryegrass sward. All the lambs were group-housed and offered ad libitum ryegrass silage during a 3-week co-variate period. This was followed by a week of dietary changeover period, after which the lambs were housed individually and offered their treatment diet ad libitum. All the lambs received a flat rate supplement of pelleted molassed sugarbeet (250 g fresh weight/day). Individual intakes were determined daily, and weekly measurements of LW and body condition score (CS) were made. Additional measurements were taken by scanning the lambs for depth of *Longissimus dorsi* (LD) muscle and subcutaneous fat. Over an experimental period of 7 weeks, the lambs offered red clover silage had a higher voluntary silage dry matter (DM) intake, total DM intake and metabolisable energy (ME) intake ( $P < 0.001$ ) than lambs offered either lucerne or ryegrass silage. This resulted in a faster ( $P < 0.001$ ) growth rate and increase ( $P < 0.001$ ) in CS, with no difference between lucerne and ryegrass silages. The feed conversion efficiency (FCE) was  $8.0 \pm 0.61$  kg feed/kg gain for lambs fed red clover silage, compared with  $16.6 \pm 2.82$  and  $10.6 \pm 1.94$  kg feed/kg gain for lucerne and ryegrass silage, respec-

*Abbreviations:* ADF, acid detergent fibre; BHB,  $\beta$ -hydroxybutyrate; CS, condition score; CP, crude protein; DM, dry matter; DOMD, OM digestibility in the DM; FM, fresh matter; LD, *Longissimus dorsi*; LW, live weight; ME, metabolisable energy; MJ, mega joule; N, nitrogen; NDF, neutral detergent fibre; NEFA, non-esterified fatty acids; OM, organic matter; TN, total nitrogen; TP, total protein; VFA, volatile fatty acids; WSC, water-soluble carbohydrates

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tively. The CP intake was higher ( $P < 0.001$ ) for lambs fed the lucerne and red clover silages than for the ryegrass silage treatment. The concentration of plasma total protein (TP) was higher ( $P < 0.05$ ) for lambs offered ryegrass silage versus lucerne and red clover silage. Urea concentrations were highest for lambs fed lucerne silage and lowest for those fed ryegrass silage ( $P < 0.05$ ). The glucose concentration was higher ( $P < 0.05$ ) for lambs offered red clover silage, whereas non-esterified fatty acids (NEFA) concentration was higher ( $P < 0.05$ ) for lambs offered lucerne silage. Substituting ryegrass silage with red clover silage has the potential to improve the performance of finishing store lambs. © 2005 Elsevier B.V. All rights reserved.

**Keywords:** Lucerne; Red clover; Store lambs; Growth performance

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## 1. Introduction

The practice of finishing of store lambs on forage-based diets is increasingly common in the UK. Although intake and performance of lambs have been found to be positively correlated with grass silage quality (Reed, 1979), lamb performance on grass silage alone is poor unless the silage is of extremely high quality, in terms of digestibility and chemical composition (Webster and Povey, 1990). In practice, this is often difficult to achieve, and supplementation of grass silage with concentrates is generally required to obtain acceptable growth rates (Fitzgerald, 1986a,b). Although supplements increase total dry matter (DM) intake, the substitution effect of some supplements, especially cereals, may reduce silage intake (Yilala and Bryant, 1985; Chestnutt, 1992; Fitzgerald, 1996). Furthermore, although there is a clear benefit of protein supplementation of grass silage on lamb growth rates (Yilala and Bryant, 1985), there are now environmental, economical and social constraints on the use of protein supplements such as fish meal and meat and bone meal within the UK. As a result there is growing demand for affordable alternative sources of protein.

Forage legumes such as lucerne (*Medicago sativa*) and red clover (*Trifolium pratense*) have been shown to have higher intake potential and high protein contents compared to grass (Fraser et al., 2000) and, in an earlier study, it was shown that intake and performance of store lambs were improved when a grass-clover silage was fed, especially if it was wilted (Reed, 1979). Although red clover and lucerne are perceived as being difficult to ensile due to a high buffering capacity and low fermentable carbohydrate concentrations (Frame et al., 1998), there has been considerable progress in ensiling technology over the past 30 years (Wilman et al., 2002), which has enabled forage legumes to be successfully conserved (Seale et al., 1986; Pahlow et al., 2002). Thus, it may be possible for lamb producers to improve the performance of finishing store lambs by feeding ensiled legumes as the basal feed rather than grass silage. There is, however, little information available currently regarding options for improving the performance of lambs of a hill breed through nutritional manipulation, or on lamb growth rates when fed ensiled forage legumes.

The objective of this study was to examine effects of feeding ensiled red clover and lucerne compared to grass silage on voluntary intake and growth performance of hill store finishing lambs, and to measure blood metabolites as a measure of nutritional inadequacy.

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