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# EFFECT OF SPECIES HORIZONTAL DISTRIBUTION ON DEFOLIATION OF RYEGRASS-CLOVER SWARDS GRAZED BY SHEEP

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## ABSTRACT

Defoliation events on labelled white clover (*Trifolium repens*) growing points or ryegrass (*Lolium perenne*) tillers were measured during grazing tests by sheep with swards consisting of mixed ryegrass-clover (MIX) or alternate strips of clover and ryegrass (STRIP). Sward surface height was maintained at 6.4 cm by lawnmower cuts in order to obtain a similar surface height for both species. On average, during 13 grazing tests in STRIP and 11 in MIX swards, clover was the more defoliated species : 23.3% of the growing points in STRIP and 26.5% in MIX swards were defoliated compared to 16.2% and 12.5% of the tillers. No difference of clover defoliation probability occurred between STRIP and MIX swards, nor between clover growing points in different neighbourhoods in STRIP sward, indicating that the horizontal distribution of clover does not affect its pattern of defoliation by sheep.

## KEYWORDS

*Trifolium repens*, *Lolium perenne*, defoliation, sward structure, selective grazing.

## INTRODUCTION

Sward structure influences the defoliation process (Demment and Laca, 1993). In ryegrass-clover swards, the species vertical distribution partly explains clover selection by sheep (Milne et al., 1982). Horizontal distribution effects were also investigated (Clark and Harris, 1985; Armstrong et al., 1993), but generally species heights were not taken into account, although differences of surface height between components offered side by side could alter the defoliation pattern (Illius et al., 1992 ; Carrère et al., 1995). This study reports the influence of horizontal heterogeneity on the defoliation probability of ryegrass and clover offered at a similar surface height during grazing tests.

## METHODS

Two *Lolium perenne* L.-*Trifolium repens* L. swards, established in 1994, were compared: in the STRIP structure, ryegrass rows were sown 32cm apart, which allowed clover, broadcasted in between, to remain pure in the interrow. In the MIX structure, grass rows 16cm apart led broadcasted clover to be well mixed with the grass. In 1995, during the experiment (May to mid-July), the sward surface height was maintained at 6.4 cm by lawnmower cuts every 2 or 3 d, in order to obtain a similar surface height for both species. Species surface heights were measured with HFRO's sward stick (90 points per paddock) and the close neighbourhood of each measured point was recorded as pure clover, pure ryegrass or mixture. Ground cover by pure or mixed species was calculated from these data. Herbage mass was measured on four 32 x 16 cm quadrats per paddock, cut to ground level at four dates. Each sample was separated into clover, ryegrass, remaining species and dead material and was stratified in two layers: 0-3cm above ground and above 3cm. Sub-samples were oven dried (48h at 80°C) and weighed.

Thirteen grazing tests in STRIP and eleven in MIX were carried out on 200 m<sup>2</sup> paddocks. For each test, a three ewe group was introduced in the paddock 4 hours before sunset. Individual grazing activity was recorded on a 5-min basis and the group was removed when 315 cumulated minutes of grazing were achieved, to ensure similar stocking rates for all grazing tests. Eighty labelled clover growing

points and 80 ryegrass tillers were observed in each paddock before and after the grazing test in order to count defoliation events. Defoliation probability was calculated as the ratio of the number of defoliated to observed plant units during a test. The neighbourhood of each labelled plant unit was recorded as pure or mixed.

## RESULTS

In STRIP and MIX swards, respectively, the mean sward surface height reached 6.4±0.1cm (mean±s.e.m.) and 6.4±0.1cm; clover surface height 5.9±0.1cm and 6.1±0.2cm and ryegrass surface height 6.7±0.1 and 6.4±0.1cm. In STRIP swards, clover did not reach the target surface height because, in pure strips, the lack of competition for light prevents petiole elongation. Nevertheless, height differences between both species were reduced to 0.6 cm for the last six tests. Concerning ground cover, in MIX swards, clover and ryegrass were present simultaneously over 63% of the area and pure grass on the remainder. Under STRIP swards, pure clover, pure grass and mixed grass and clover accounted, respectively, for 26, 26, and 48% of the paddock's area. Clover content in the biomass of the upper layer increased during the experiment and was significantly higher in STRIP (35.7%) than in MIX sward (23.4% ; p<0.01).

In STRIP swards, clover growing points located in the pure strips were equally defoliated than those mixed with grass (26 vs 28%, NS). The average defoliation probability under STRIP was therefore calculated for all growing points. On average, a similar percentage of the labelled plant units was defoliated in STRIP (21.9%) and MIX (19.4%) swards. Defoliation probability was significantly higher for clover growing points than for tillers in both swards (Fig. 1). The mean ratio of clover to ryegrass defoliation probability was of 2.0 under STRIP and 2.9 under MIX sward (p<0.08).

## DISCUSSION

The higher defoliation probability of clover growing points compared to tillers indicates a sheep diet selection for clover which was previously reported by Clark and Harris (1985) and Armstrong et al. (1993). Diet selection for clover in the MIX swards occurred although the grass and clover were at the same surface height. In this treatment, ryegrass defoliation probability was significantly (p<0.05) greater in the mixed compared to the pure grass patches. Therefore, clover diet selection in MIX resulted from the partial avoidance of the pure grass patches, which accounted for one third, approximately, of the ground cover. In the STRIP swards, on the other hand, the ewes grazed more often the pure clover compared to the pure grass strips (p<0.01) and clover was also more often defoliated than grass in the mixed patches (p<0.05). These results show that, under our experimental conditions, the average scale of the grass and clover patches did not affect to a large extent diet selection by sheep. Nevertheless, there was a tendency (p<0.08) for a lower degree of selection for clover in the STRIP compared to the MIX treatment. This might result : i) from the higher clover content in the STRIP treatment (Armstrong et al., 1993) ii) from the slightly lower surface height of clover compared to grass in the STRIP treatment (Carrère et al., 1995).

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**Figure 1**

Defoliation probability of clover growing points (O) and ryegrass tillers (•) under STRIP (A) or Mixed (B) ryegrass-clover sward grazed by sheep during 13 or 11 independent test periods.

