

# PERSISTENCE OF CONTRASTING PERENNIAL RYEGRASS - WHITE CLOVER MIXTURES AT TWO DEFOLIATION FREQUENCIES

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## ABSTRACT

Mixtures of two cultivars of perennial ryegrass with contrasting growth habits and three white clover cultivars differing in leaf sizes were evaluated at two cutting frequencies to study white clover persistence. A trial was sown in 1991 on a clay soil. The plots received no nitrogen fertilizer.

Throughout the years, mixtures with the large-leaved clover cv. Alice yielded significantly more herbage dry matter and had a higher clover content than mixtures with cvs. Gwenda and Retor. Companion grass cultivar did not consistently affect yield, nor botanical composition. Cutting at 2 t DM ha<sup>-1</sup> resulted in slightly higher total annual yields than cutting at 1.2 t DM ha<sup>-1</sup>, but did not affect clover content.

From 1992 to 1994 the total herbage yield DM in the mixtures declined from 12.2 to 10.5 to 8.7 t ha<sup>-1</sup>, the white clover yield from 8.7 to 6.5 to 4.1 t ha<sup>-1</sup> and the average clover content during the growing season from 71 to 61 to 46%, whereas the grass yield increased from 3.4 to 4.0 to 4.5 t ha<sup>-1</sup>. However, in 1995 total yield increased to 11.7 t ha<sup>-1</sup>, white clover yield to 7.1 t ha<sup>-1</sup>, clover content to 61% and grass yield was 4.4 t ha<sup>-1</sup>. There were no major interactions between clover and grass cultivars.

## KEYWORDS

Grass-clover mixtures, clover persistence, companion grass, cutting interval

## INTRODUCTION

As the amount of N fertilizer applied to grassland is decreasing in The Netherlands, there is renewed interest in white clover with its nutritional benefits and its ability to fix N<sub>2</sub>. Clover content and persistence are affected by many factors. New white clover cultivars may offer prospects for improved clover persistence in mixtures. Therefore, the new cvs. Alice and Gwenda were compared with the older cv. Retor. Each clover cultivar was mixed with either a tetraploid or a diploid perennial ryegrass cultivar and mixtures were evaluated at two cutting frequencies.

## METHODS

The tetraploid perennial ryegrass cv. Condesa (C) and the diploid Barlet (B) each were sown alone or mixed with the white clover cvs. Alice (A) (large-leaved), Retor (R) (medium-leaved) and Gwenda (G) (small-leaved) in April, 1991 on heavy river clay at Wageningen, The Netherlands (Elgersma and Schlepers, 1994). There were six mixtures (CA, CR, CG, BA, BR, BG) and two grass monocultures (C and B) in three replications in a split-plot design with cutting frequency as main factor. The plots were cut at approximately 1200 or 2000 kg DM ha<sup>-1</sup> from 1992 onwards. No fertilizer N was applied.

## RESULTS AND DISCUSSION

From 1992 to 1994 the total herbage yield DM in the mixtures declined from 12.2 to 10.5 to 8.7 t ha<sup>-1</sup>, the white clover yield from 8.7 to 6.5 to 4.1 t ha<sup>-1</sup> and the average clover content during the growing season from 71 to 61 to 46 %, whereas the grass yield increased from 3.4 to 4.0 to 4.5 t ha<sup>-1</sup>. The lower total and clover yield in 1994 was caused by a sudden heavy frost in February, 1994 following a mild period. The clover content then dropped sharply in all mixtures, but recovered during the growing season of 1994 (Fig. 1). Throughout the years in both cutting frequencies, the mixtures with cv. Alice always had the

highest clover content, and the mixtures with cv. Retor tended to have less clover than those with cv. Gwenda. In 1995 total yield increased to 11.7 t ha<sup>-1</sup>, white clover yield to 7.1 t ha<sup>-1</sup>, clover content to 61 % and grass yield was 4.4 t ha<sup>-1</sup>. The grass yield in the mixtures increased from 3.6 to 4.2 to 5.0 t ha<sup>-1</sup>. In the grass monocultures, the yield remained low (< 2 t ha) throughout the years.

The mixtures with clover cv. Alice yielded most during the whole season in all four harvest years and at both cutting frequencies, only in 1995 in F2000 their yield was not significantly different from mixtures with cv. Gwenda (Figure 2). There was a highly significant (P £ 0.001) effect of mixture on DM yield, which was caused by the clover cultivar. Companion grass cultivar generally did not affect the clover content or yield in the mixtures, in contrast to the finding of Frame and Boyd (1986) that diploid grasses form a dense sward with less clover in the mixture than tetraploids with their more open growth habit. This may be due in part to the erect growth habit of cv. Barlet, which makes it less contrasting with a tetraploid than a 'typical' diploid. In Barlet the tiller density was higher than in Condesa, but not as high as in a prostrate diploid grass cultivar (Elgersma and Schlepers, 1997). Apparently, tiller density is not the only factor that determines grass-clover interactions. Generally, each clover cultivar responded in a similar way to both companion ryegrass cultivars. The F2000 treatment consistently yielded more than F1200 for all mixtures throughout the years. White clover had persisted five years after sowing in all plots.

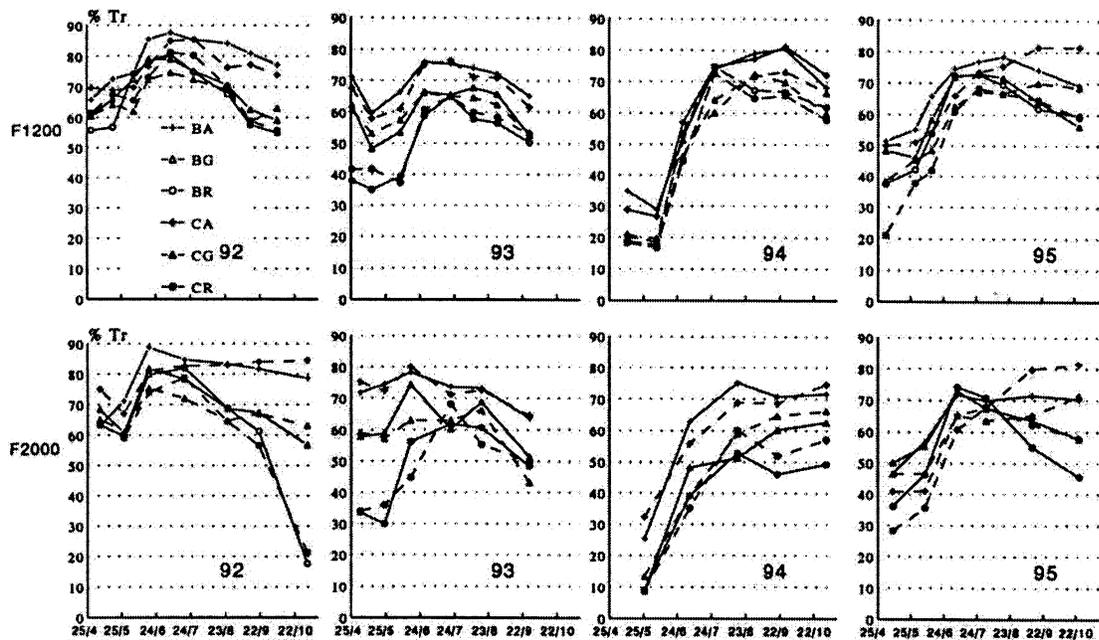
## REFERENCES

- Elgersma, A. and H. Schlepers.** 1994. Contrasting perennial ryegrass / white clover mixtures under cutting and grazing. Pages 69-72 in L. 't Mannetje and J. Frame, eds. Grassland and Society. Proc. 15th General Meeting of the European Grassland Federation, Wageningen Pers, Wageningen, The Netherlands.
- Elgersma, A. and H. Schlepers.** 1997. Cattle production and botanical composition in continuously stocked grass-clover swards. IGC, Canada (accepted) [ID 916].

- Frame, J. and A.G. Boyd.** 1986. Effect of cultivar and seed rate of perennial ryegrass and strategic fertilizer nitrogen on the productivity of grass/white clover swards. Grass and Forage Science **41**: 359-366.

**Figure 1**

The percentage white clover (DM basis) in the harvested material of six grass/clover mixtures cut at approximately 1200 and 2000 kg DM ha<sup>-1</sup>, respectively, 1992-1995.



**Figure 2**

The annual harvested DM yield of perennial ryegrass (Lp) - white clover (Tr) mixtures at two cutting frequencies during 1992 - 1995.

